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FEBRUARY, 1956

METAL FINISHING

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FEB 24 1956

Some Tips on Electroforming
Fabrication by Means of Electrodeposition

Production Barrel Finishing
Planning, Installing and Operating Bulk Finishing Departments

Proposed "Substitutes for Nickel Plating"
Some Comments on the Nickel Situation

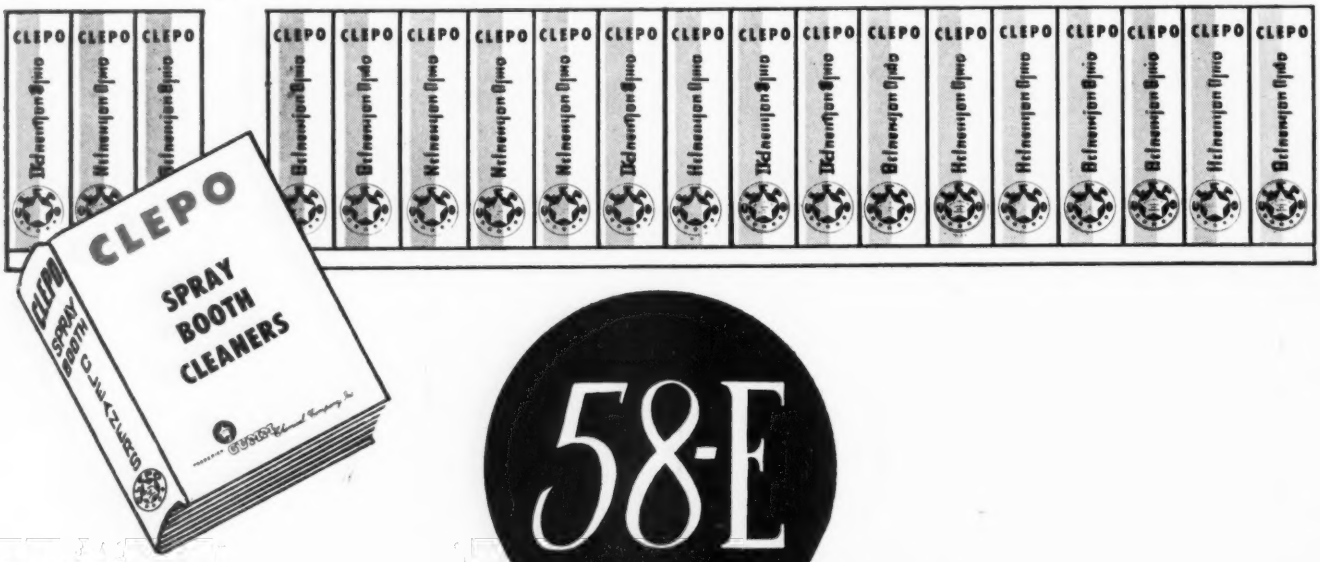
Science for Electroplaters
Electrolytes

Complete Contents Page 49

WHERE PLATERS AND FINISHERS LOOK FOR INFORMATION
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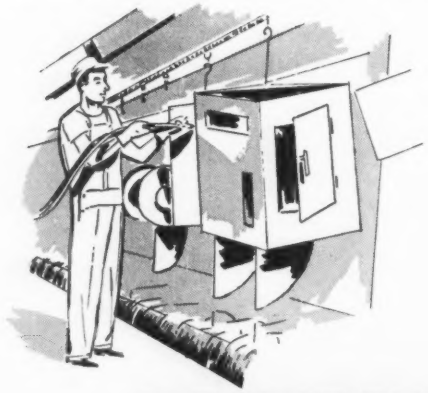
58-E

57-T

CLEPO
METAL FINISHING CLEANERS AND PROCESSES

CLEANING... but not at the expense of low foaming

LOW FOAMING... but not at the expense of good cleaning



These two advantages, complementing one another, emphasize why so many organic finishing shops have turned to and are staying with CLEPO Cleaners for spray booth operations. For with these products, effective cleaning is accomplished without making a mess of things through excessive or uncontrollable foaming.

Why not try CLEPO 58-E or 57-T in your spray booth waterfalls? Write or phone and give us the details of your operations and of your troubles. We'll have experienced field men call to lend a helping hand.

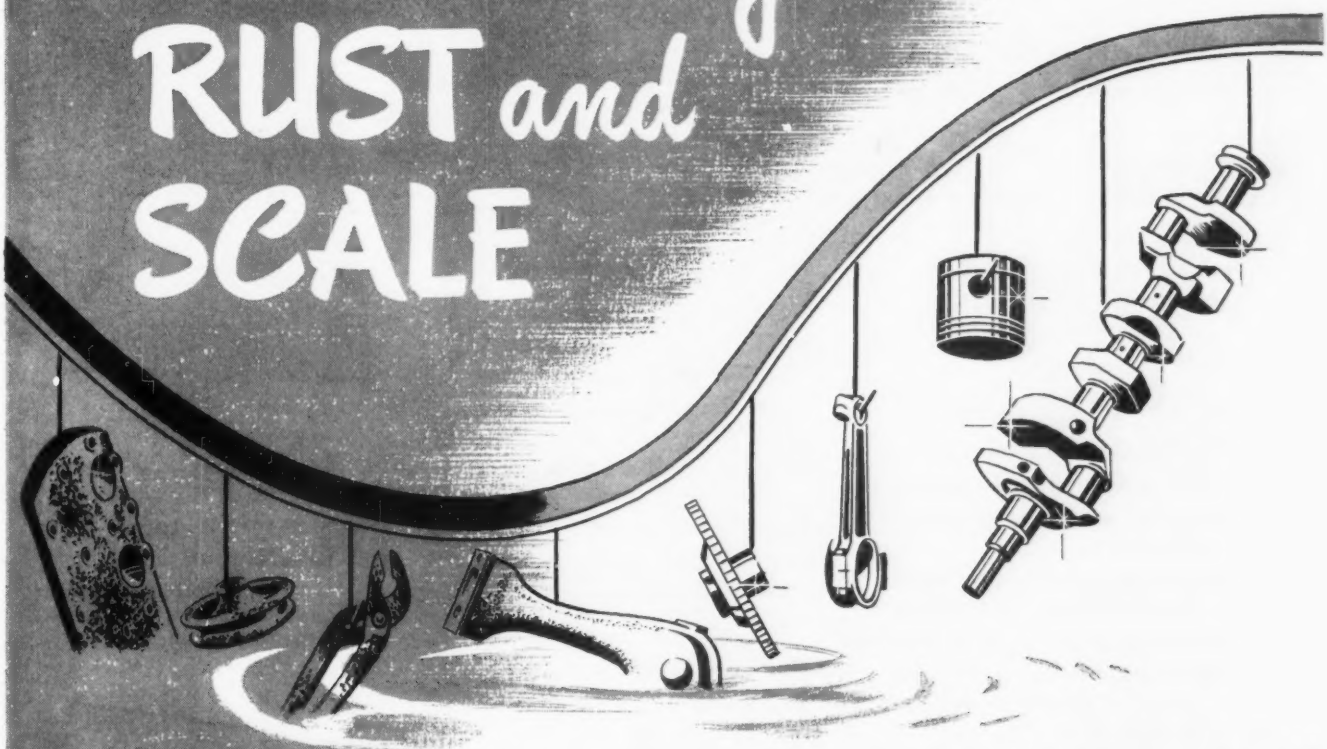
Again permit us to emphasize that formulating cleaners and strippers for finishing operations has been our *specialized* business for twenty years. We've concentrated on this work. Our field men are broadly experienced in servicing CLEPO Products.

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An alkaline electrolytic process for rapid, removal of rust and scale from steel, cast iron and malleable iron. Operates at room temperature. No attack on basis metal. Uses Enthone Compound 134.

A solvent acid cleaner for rapid removal of oil, rust and oxide from steel, zinc, aluminum and other metals to prepare them for painting or organic finishing.

A powdered acidic compound added to water to make pickling solutions for iron and steel. Safer to handle than sulphuric acid. Gives controlled acidity to prevent overpickling.

A dispersing agent added to acid pickles to remove colloidal and siliceous films from metals. Also an additive for sulphuric and nitric acid pickles to promote faster pickling of stainless steel, aluminum and titanium.

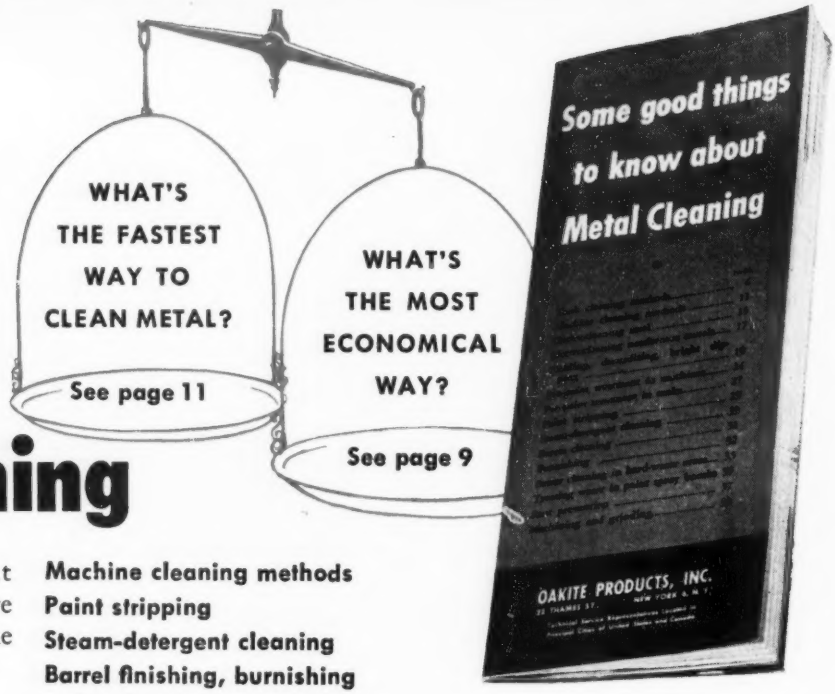
A surface active material extensively used in acid pickles to reduce fuming, to give better wetting and to promote better pickling.

An all-purpose inhibitor for acids including sulphuric and hydrochloric acids to stop attack on steel during pickling.

Write for fully descriptive literature.

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answers many questions that mean better production, more profit for you. Just look at the table of contents:

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Electrocleaning nonferrous metals
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Applying zinc phosphate coatings
Cleaning, removing rust and conditioning for painting in one operation
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You'll want to know the answers

Can one cleaning material do all metal-cleaning jobs? *See page* 5.

What kind of cleaner attracts both oil and water? How does this help remove buffing compound residues and pigmented drawing compounds? *See page 8.*

Why clean ferrous and nonferrous metals in separate tanks? *See page* 10.

What are the advantages of reverse current for electrocleaning steel? *See page 15.*

For electrocleaning nonferrous metals, what are relative advantages of cathodic, cathodic-anodic and soak-anodic cleaning? *See page* 17.

Can you electroclean brass without tarnishing? *See page 18.*

How do bright dips make metals brighter? *See page* 21.

Can you clean steel and condition it for painting for less than 20 cents per 1,000 square feet? *See page 24.*

Would you like a cleaner that removes rust and oil at the same time; often eliminating all need for pickling? *See page* 28.

What's the best way to clean parts that are too large to be soaked in tanks or conveyed through washing machines? *See page 30.*

Does your burnishing barrel produce a luster you are proud of? *See page* 32.

What do you do when the overspray neither sinks nor floats in the wash water in your paint spray booth? *See page 35.*

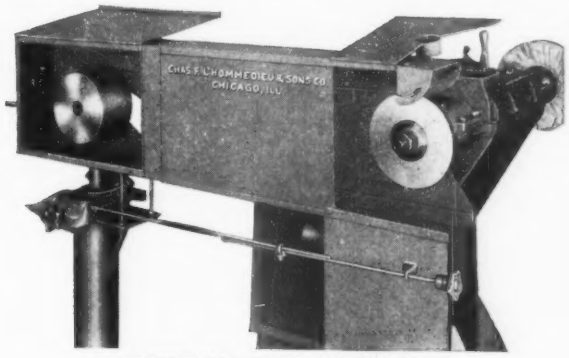
Do you dry steel parts before anti-rusting? *See page* 37.

Metal Finishing is published monthly by the Finishing Publications, Inc., 381 Broadway, Westwood, New Jersey, U.S.A.
Entered as second class matter at the Post Office in Westwood, N. J. Volume 54, No. 2, February, 1956. Four Dollars Per Year.

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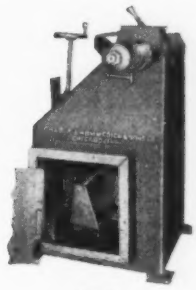
WRITE FOR FURTHER DETAILS



BACKSTAND IDLER WITH LATHE

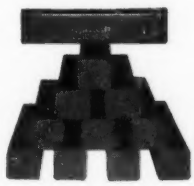


OBLIQUE
TUMBLING BARREL



#23A
POLISHING LATHE





EXTRUDED COMPOSITIONS
STANDARD SIZE
2 x 2 x 10"



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FAST CUTTING

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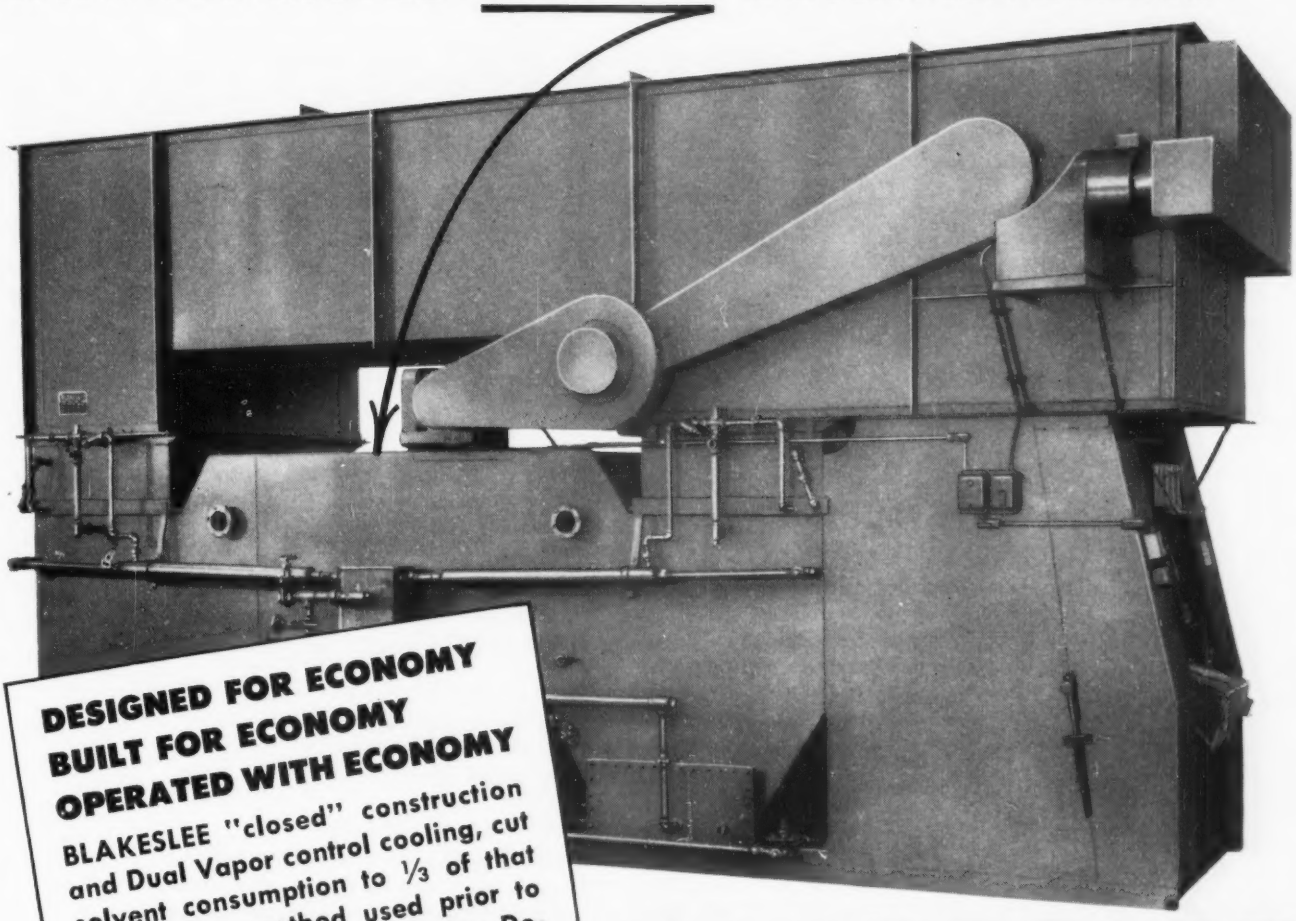
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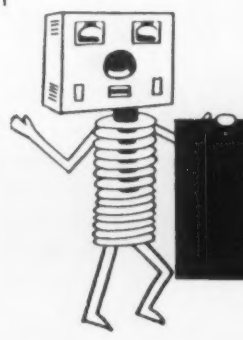
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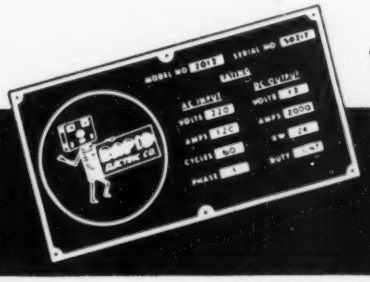
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These additional Liquimatic features mean real savings in terms of time, money, safety—

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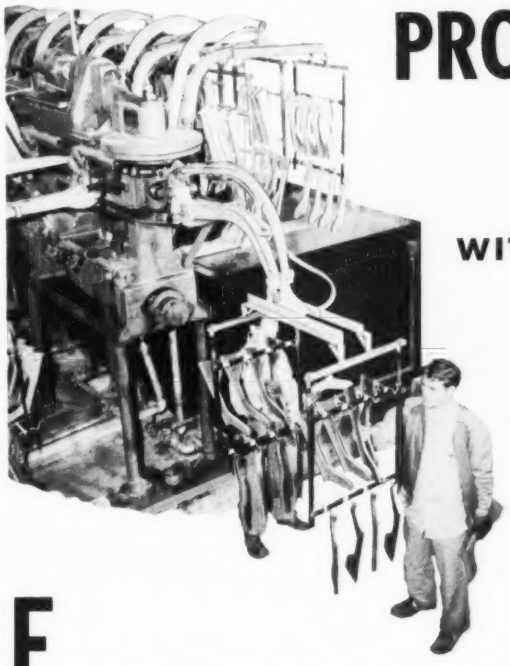
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STEVENS Slants ON METAL FINISHING

"FROM THE CASTING OR STAMPING TO THE FINAL FINISH"



PRODUCTION JOBBING PLANTS ARE CUTTING COSTS

WITH STEVENS AUTOMATIC PLATING AND PROCESSING MACHINES

● ● ●

FIRMS doing production electroplating and immersion processing on a contract basis have found the installation of automatic equipment brings a number of advantages to their operations.

Frederic B. Stevens, Inc., has long paid much attention to the needs of production platers and metal finishing plants and have developed automatic equipment that will fit the needs of any size plant, both from the standpoint of production requirements and capital investment.

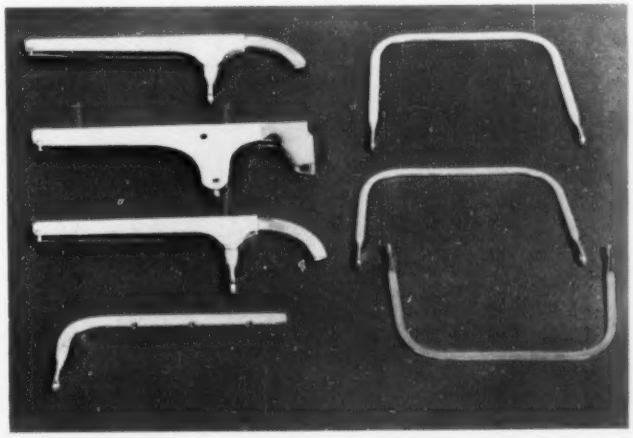
The chief advantages of automatic equipment are:

1. Improved plant layout requiring less floor space and resulting in less time loss by unnecessary movement of the operator.
2. Uniformity of deposit thickness which is especially important where specification electroplating is required.
3. Fewer rejects due to accidental marring of finishes as parts are transferred manually from one tank to another.
4. Unskilled workmen can operate equipment.
5. Better working conditions.
6. Easier chemical control.
7. Easier scheduling of work—better delivery to customers.
8. Lower plating cost per piece.

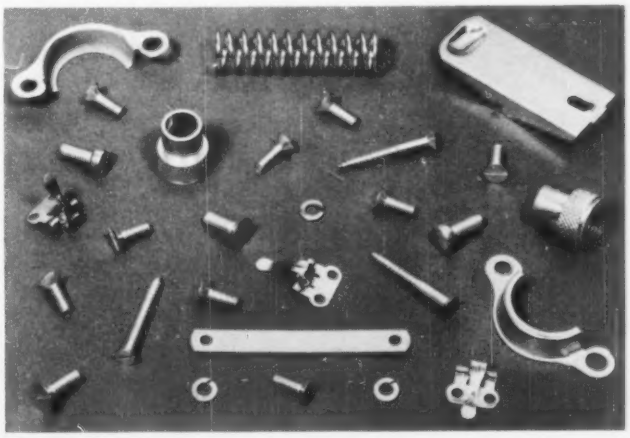
Numerous production shops throughout the United States are now using Stevens automatic equipment. For years the Stevens Model "C" automatic barrel has been a profit maker to platers. It will turn out hundreds of pounds of plated small parts daily.

The machine is versatile and will handle a diversified group of parts – so important to production plants doing contract work.

Stevens "Little Steve" is a new type machine which fits ideally in the production picture. It is a small machine with high production at an initially low cost.



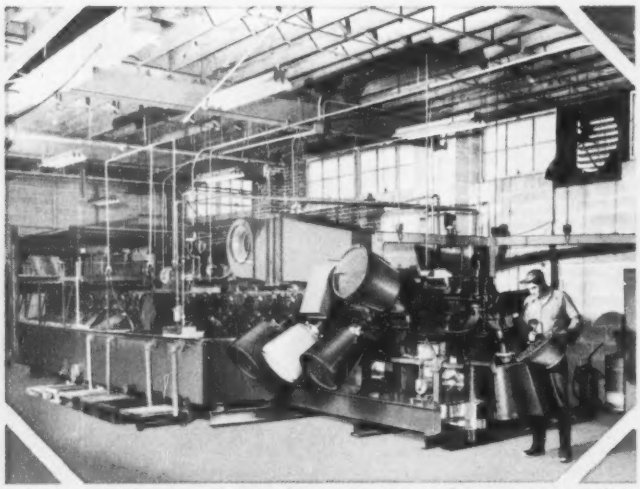
Typical parts plated on a Stevens Model "A" rack type plating in a production plating shop.



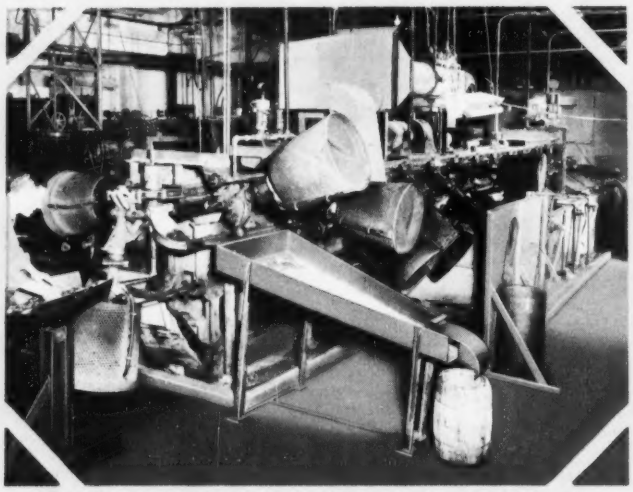
The Stevens Automatic Barrel Machines turn out thousands of pounds of plated small parts daily.

STEVENS Slants ON METAL FINISHING

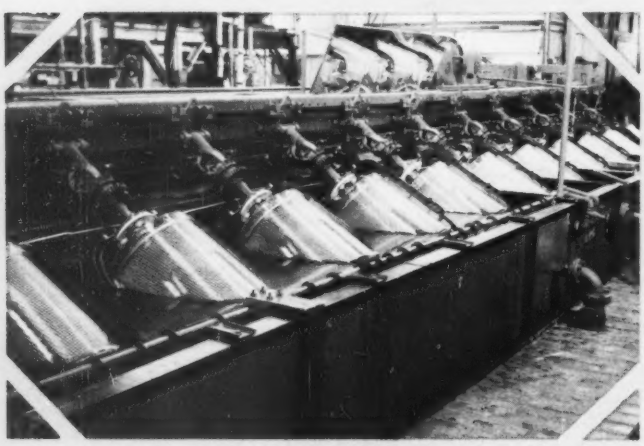
A page from the
STEVENS SCRAPBOOK
FEATURING AUTOMATION IN PRODUCTION JOBBING PLANTS



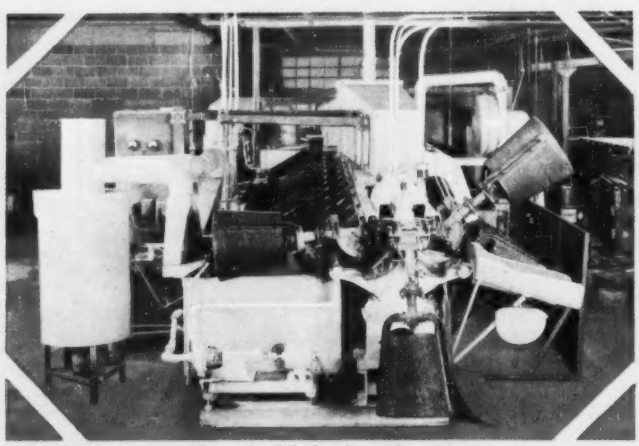
Homer A. Doerr and Son, St. Louis, Mo., plate a variety of small parts in quantity to closer tolerances with this Stevens Automatic Barrel. Operating costs have been reduced.



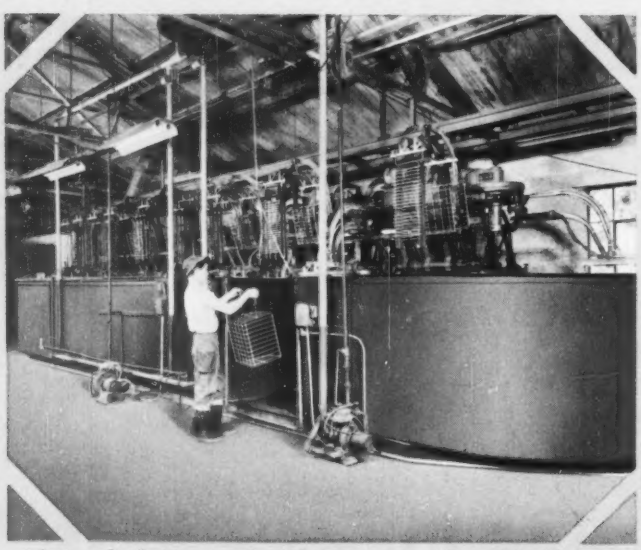
Reilly Plating Co., Melvindale, Michigan, turn out big orders of cadmium and zinc plated small parts with this Stevens Automatic Barrel Machine which gives them faster delivery.



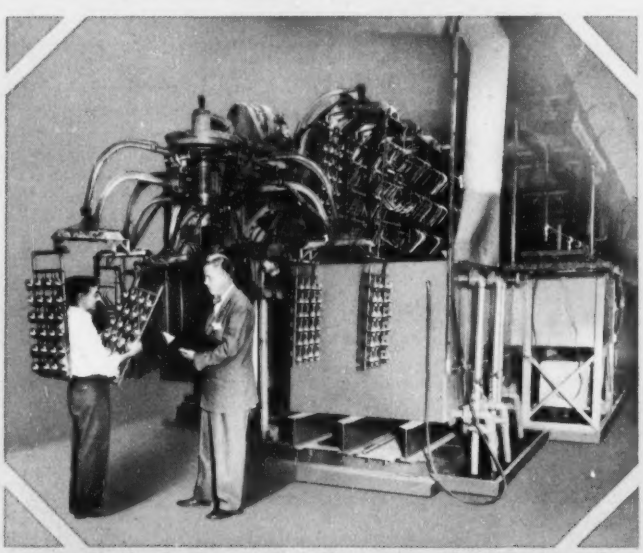
Spectranome Plating Co., Inc., New York City, electroplate fine nickel finishes with this Stevens Automatic Barrel Machine. This machine was the 750th Automatic produced by Stevens.



Production more than doubled when this Stevens Automatic Barrel Plating Machine was installed by Midwest Plating and Chemical Corporation, Kokomo, Indiana



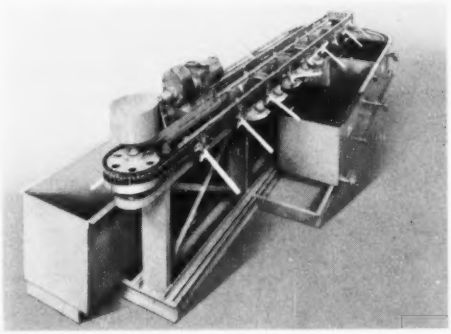
Plating both Zinc and Cadmium parts, the Olds Plating Corporation, Detroit, Mich., finds this Stevens Model "A" Plating and Processing Machine keeps deliveries rolling.



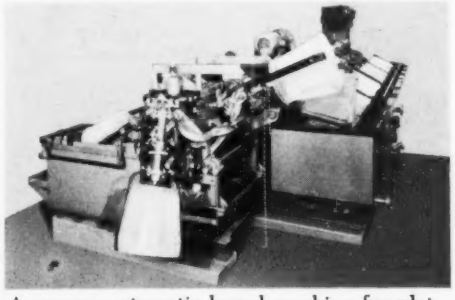
New England Plating Co., Worcester, Massachusetts, do nickel plating dichromating quickly – economically on Stevens Automatic Plating and Processing Machines.

STEVENS Slants ON METAL FINISHING

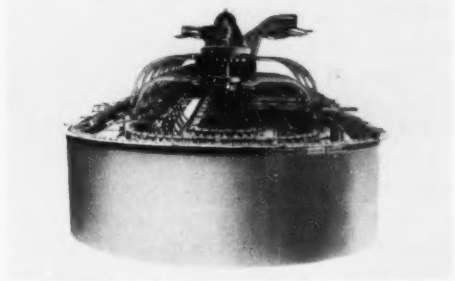
STEVENS MACHINES FOR PRACTICAL JOB-SHOP AUTOMATION



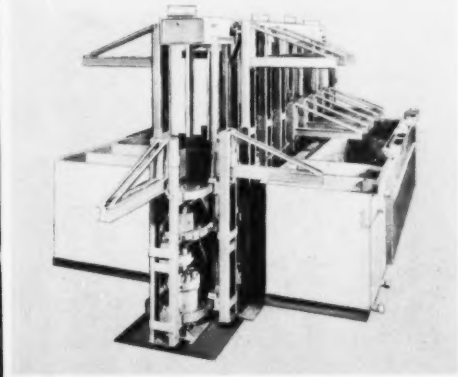
Low initial and low operating costs are features of this newly introduced small automatic which has a big capacity for its size.



A proven automatic barrel machine for plating and processing small parts. Only unit with fully automatic load and unload features.



A compact automatic processing machine, embodying the famous Stevens auxiliary cam shaft and lifters for rapid vertical transfer.



Unit's load capacity, mechanical flexibility and lift design meet tomorrow's increased safety and production requirements.

"LITTLE STEVE" PAYS OFF

THE FINISHING TOUCH



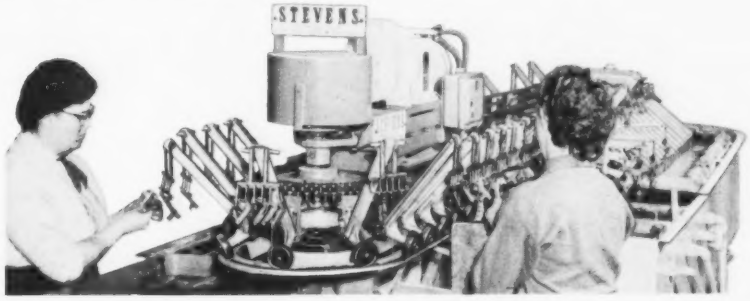
by A. B. HOEFER
vice president
FREDERIC B. STEVENS, INC.

Production Plater Finds Machine Ideal For Zinc Plating

There's a feeling of satisfaction among the people in our company when a Stevens machine is installed and does a better job than the customer anticipated. That feeling reaches all the way from President through engineers, salesmen and typists who write up the specifications.

We are particularly proud of an installation of one of our "Little Steve" machines made recently for the Miller-Smith Manufacturing Company, Spring Lake, Michigan. The partners, John Miller and George Smith, are operating an aggressive business in job buffing and plating, and after receiving some of our literature including a story on the "Little Steve," soon made a purchase from us.

The "Little Steve" fit ideally into their program. The capital outlay met their requirements and the machine is daily turning out a big quantity of zinc plated parts for them. In fact, 105,000 can be plated each working day, which right now is an around-the-clock operation. Just as soon as new racks are built they expect to double present production on some of the parts.



The Miller-Smith management tell us that they are operating much more efficiently now than they did previously with a competitive machine. Parts are being zinc plated to a .0002 thickness every three minutes. They are saving on valuable floor space too, for the "Little Steve" occupies only 162 square feet as compared to 441 square feet used by their previous equipment.

When we asked for comments about the "Little Steve" from Messrs. Miller and Smith, they said: "We are well pleased with the machine —in fact, we're proud of it. We'll be glad to recommend it to anyone." While we are not unused to such comments on our various machines, each new one gives us a warm glow of satisfaction.

This efficient machine fits easily into existing factory layouts because of its size. Only seven feet wide and ten or more feet in length, it can be placed on a factory floor without moving existing machinery.

For further information write to Frederic B. Stevens, Inc., Detroit 16, Michigan.

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DETROIT 16, MICHIGAN

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STEVENS Slants ON METAL FINISHING

TIPS AND TATTLE

While there has been automation in plating for a good number of years, it has been only recently that the big trend has been to *complete* automation. This means automatic load and unload of parts in a continuous flow of production operation. F. B. Stevens, Inc., has developed several load and unload devices, which might be added to existing plating equipment. Why not check with our engineers?

• • •

McGraw-Hill's survey of business for 1956 estimates a 13% gain in industrial and commercial outlays for construction and for new equipment. New orders and the backlog on our books indicate that plating and processing machines will play an important part in these gains.

• • •

The meteoric rise in use of aluminum is being met by Stevens with automatic machines for bright dipping, anodizing and dyeing of various fabricated parts. We were privileged, recently, to see an advance proof of an article to appear soon in the magazine *Modern Metals* on aluminum finishing by Light Metal Processors, Inc., Chicago, Ill. If you are interested in aluminum finishing, we think you will find it interesting. If you do not have this magazine available, write us and we will obtain a reprint for you.

• • •

Helpful toward greater shop productivity are Stevens L.V. reports. These reports tell you the type of buffs, speeds, compositions to use on specific buffing and polishing jobs. These reports are a free service by F. B. Stevens, Inc.

• • •

We have for distribution three interesting reprints on subjects of interest to plant managers and others concerned with metal finishing operations. These articles cover: "Automatic Barrel Zinc Plating" – Unistrut Corporation – *Iron Age* – "Continuous Flow Automatic Barrel Washing, Zinc and Cadmium Plating" at Shakeproof, Inc., division of Illinois Tool Works – *Steel.*

And the design features of the new "Stevadoer" that were the basis for the *Modern Design* award presented to Frederic B. Stevens, Inc.

Write for your copies today.

NEW MERCHANDISING SERVICE FOR PRODUCTION PLATERS

• • •

Does your company promote to customers the fact that you have modern automatic equipment for electroplating in your plant? Do you tell them that your equipment insures better metal finishes at closer tolerances?

If you believe such promotion will be helpful, and if you now own or are preparing to purchase Stevens automatic equipment, Stevens is prepared to assist you in such mailings.



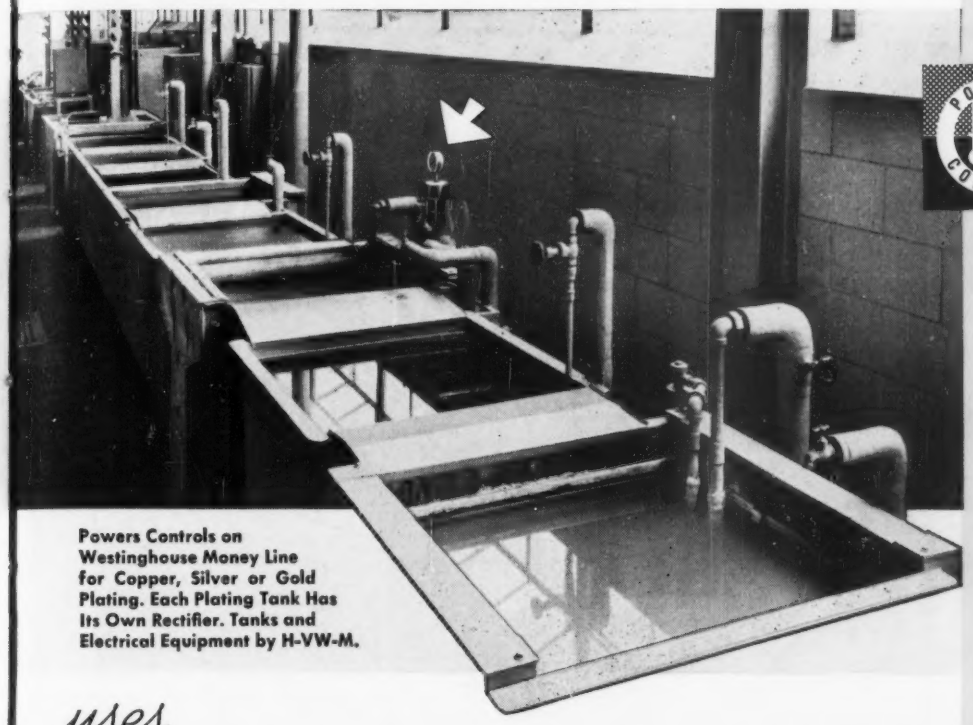
Illustrated above is a two-color mailer which we will furnish to you *without charge*. It will contain an imprint of your company name and an illustration of the Stevens automatic plating machine you have installed. All you need do is furnish us with a photograph of the Stevens machine and your correct company name and we will imprint and ship the quantity you desire all ready for proper addressing.

This type of advertising tells your customers that you have the finest equipment available. That you can make fast delivery of quality plated parts—that plating thicknesses are uniform—that the work is done automatically with exacting timing. The human element is eliminated.

FREDERIC B. STEVENS INCORPORATED
YOUR METAL FINISHING SUPERMARKET
DETROIT 16, MICHIGAN

AIR ARM DIVISION
Westinghouse

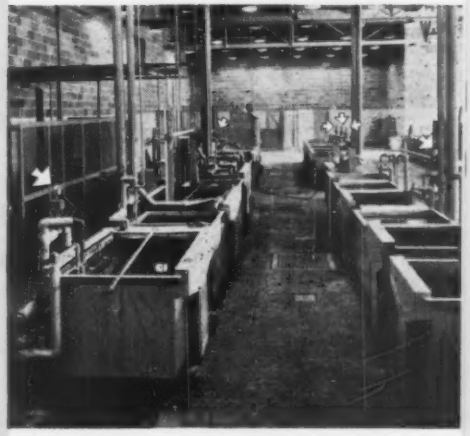
BOOSTS PLATING OUTPUT—HOLDS REJECTIONS TO VIRTUALLY ZERO



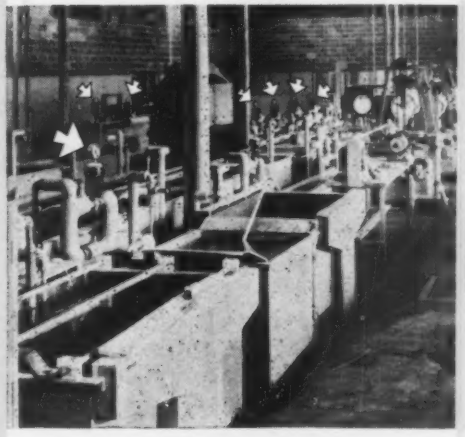
Powers Controls on Westinghouse Money Line for Copper, Silver or Gold Plating. Each Plating Tank Has Its Own Rectifier. Tanks and Electrical Equipment by H-VW-M.



Self-Operating Controls on Aluminum Cleaning Line.



Controls on Dual Anodizing Line (left) and Magnesium Cleaning Line.

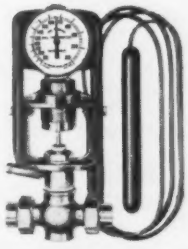


Tin, Cadmium and Zinc Barrel Plating Lines with Powers Controls.

uses

POWERS TEMPERATURE CONTROLS

to help maintain stiff standards!



The Air Arm Division of Westinghouse utilizes time study to boost production, standardize methods, train employees, and keep costs competitive. In this new Baltimore plating plant, production *stays* high.

Hundreds of odd shapes are plated in small lots — any of 16 ways. These electronic parts may be aluminum, magnesium or steel. And Powers Self-Operating Temperature Controls help maintain exceptional plating quality. Rejections are virtually zero.

Your plating operation can profit from the use of Powers Temperature Controls. Contact the Powers office nearest you, or write us direct.

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SKOKIE, ILLINOIS • OFFICES IN 60 CITIES IN U.S.A., CANADA, AND MEXICO • SEE YOUR PHONE BOOK
OVER 60 YEARS OF AUTOMATIC TEMPERATURE AND HUMIDITY CONTROL

(c26)

for **TEMPERATURE CONTROL**....*call*.. **POWERS**

New Crack-Free Chromium Plate gives superior protection

Structurally perfect chromium finish

Differences in the structure of ordinary chromium and Crack-Free Chromium deposits are shown by the photomicrographs below.

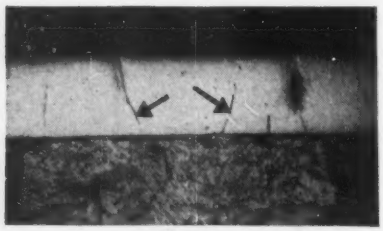


Fig. 1



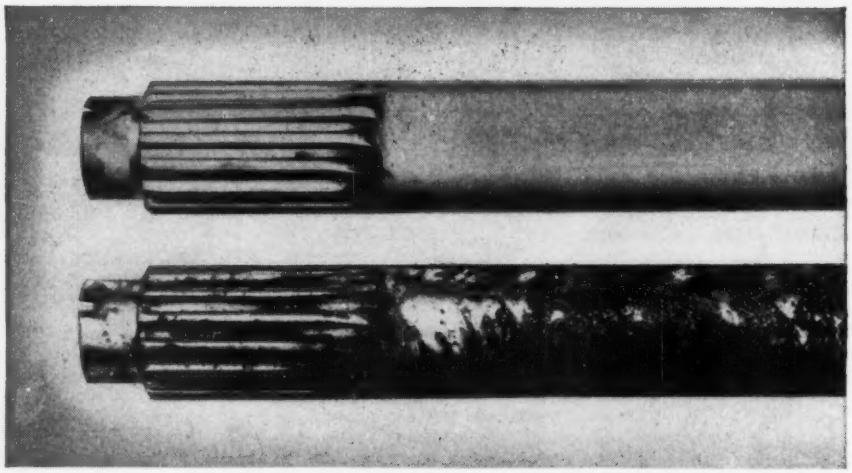
Fig. 2

Figure 1 shows a cross section of etched ordinary chromium .00125" thick, with part of its network of cracks. Note that some cracks extend through the deposit to the base metal, providing an unimpeded path for corrosives.

Figure 2 shows a section of etched Crack-Free Chromium also .00125" thick. Note the complete absence of cracks.

• • •

UNITED CHROMIUM DIVISION
METAL & THERMIT CORPORATION
100 East 42nd Street, New York 17, N. Y.
Detroit 20, Mich. • Waterbury 20, Conn.
East Chicago, Ind. • Los Angeles, Calif.
In Canada:
Metal & Thermit-United Chromium of Canada, Limited, Toronto 1, Ont.



Upper steel shaft, with 0.0005 inch of Crack-Free Chromium, was virtually unaffected after 100-hour salt spray test. Surface of lower shaft with 0.0005 inch of ordinary chromium was completely covered with rust.

A basic need has at last been satisfied. A chromium deposit which gives better protection against corrosion is now obtainable by means of a new process developed by United Chromium.

Unichrome Crack-Free Chromium Plating produces more ductile deposits which are free from cracks. Deposits do not crack even when they are built up to hard plating thicknesses. In this respect they are unlike ordinary chromium which develops cracks, providing corrosives with paths to the underlying metal.

EFFECTIVE PROTECTION DIRECTLY ON STEEL

The photograph above shows that .0005" of Crack-Free Chromium plated directly on the steel prevented rusting of shafts subjected to 100 hours of salt spray, while the same thickness of ordinary chromium failed completely.

In other corrosion tests, parts plated with .0003" of Crack-Free Chromium were as good as new after a full year at 100% relative humidity and 110°F whereas parts with ordinary chromium were entirely covered with rust in days.

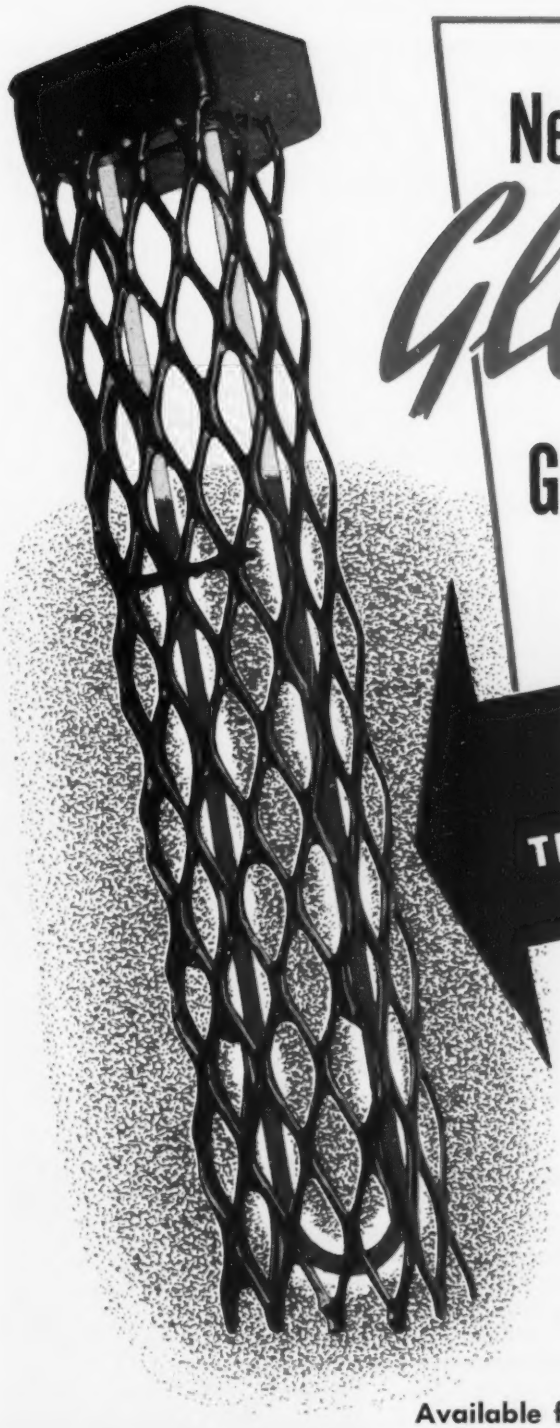
For many decorative applications, Unichrome Crack-Free Chromium can be plated directly on steel or zinc base die castings, eliminating need for scarce nickel.

OTHER BENEFICIAL PROPERTIES

Crack-Free Chromium deposits are hard (500 to 700 Knoop), have a low coefficient of friction, and a non-galling, non-seizing surface. The plate has superior ductility and resistance to thermal shock. Unusual leveling action is provided by the solution.

Its grayish, matte finish needs buffing for high luster, but this is done as readily as buffing dull nickel. Attractive two-tone effects can be produced by buffing some areas, leaving others as plated.

Unichrome Crack-Free Chromium has already proved its advantages for hard chromium plating and certain decorative applications in successful commercial operations. Bulletin CFC-1 gives more details. Send for your copy.



New! Revolutionary! Type "U"

Glo-QUARTZ* Heater

Gives Amazing Performance

TYPE "U"
PAT. PENDING
TRANSLUCENT FUSED QUARTZ IMMERSION HEATER

Guaranteed for One Year

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First Major Improvement in Quartz Immersion Heaters in 35 years

- **HEATS INSTANTLY**
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- **GUARANTEED TO OUT-PERFORM AND OUT-LAST ALL OTHER QUARTZ HEATERS**

Available from your Electroplating Distributor!

Big Savings For You With Type "U" Immersion Heaters

You get much longer service life with greatly improved accuracy and heating efficiency from the new Type "U" Glo-Quartz Heaters. Order today—and save time, trouble, money!

WRITE, WIRE or PHONE FOR BULLETINS AND PRICES

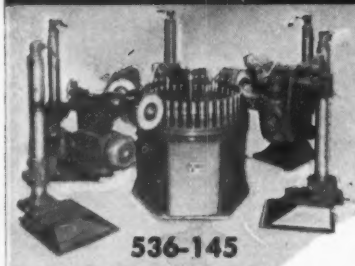
Standard Sizes in Stock for Immediate Shipment



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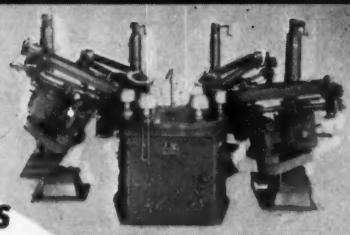
*Trademark Reg. U.S. Pat. Off. WILLOUGHBY, OHIO Phone: Willoughby 2-5521

ACME *Rotary Automatics*



536-145

. . . cut costs on production finishing



512-9-2

ROTARY TABLES ARE AVAILABLE IN SIZES UP TO 24 FT. DIAMETER



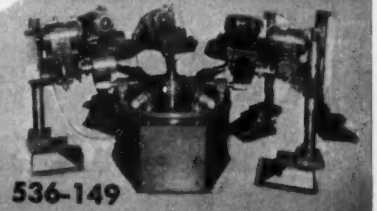
534-337

ACME 8 FT. *Combination Type* ROTARY AUTOMATIC

● This machine can be readily changed from a 32 spindle continuous rotary automatic to an 8 station indexing rotary automatic by simple hand crank adjustment. Various types of ACME adjustable floating head polishing and buffing lathes are used including belt arm attachments on buffing heads, utilizing the same heads for buffing or belt operations. Spindle arrangements are available in multiples of 8.



Rotary Catalog on Request.



536-149

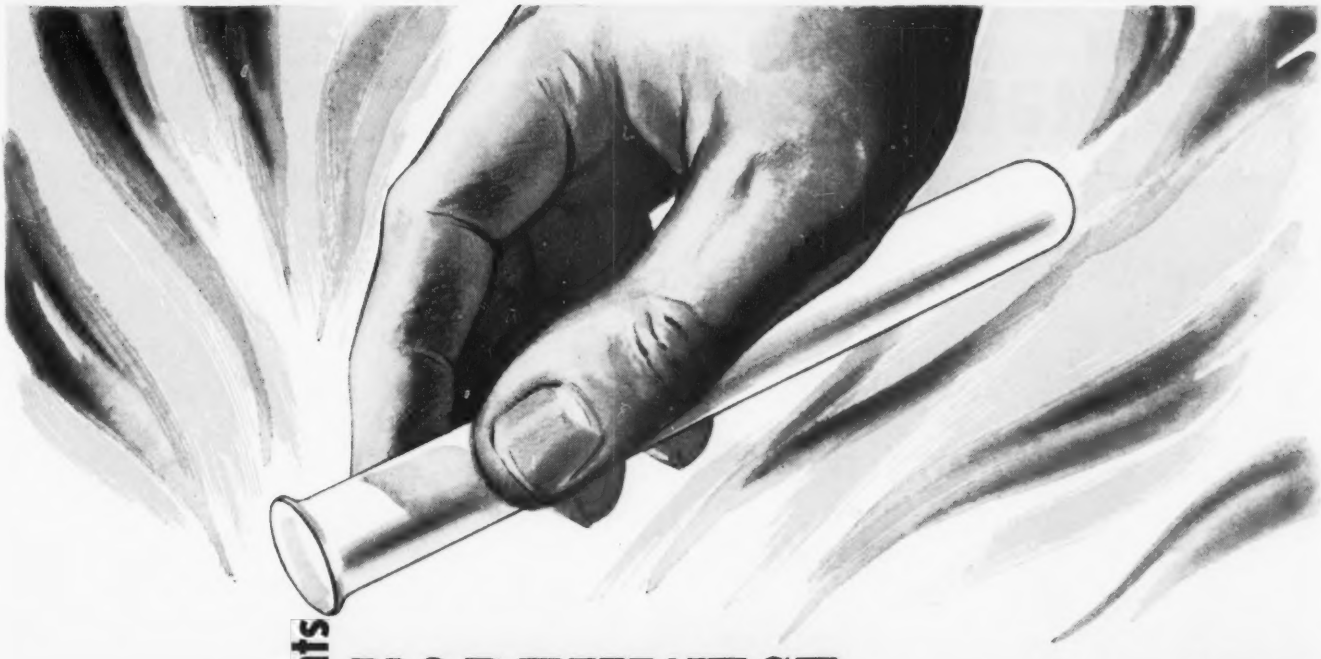
RECOMMENDATIONS and QUOTATIONS . . . will be offered on receipt of blue prints or preferably finished and unfinished parts you contemplate finishing, together with details of your present finishing operations and production requirements.

SPECIAL MACHINERY AMC AUTOMATIC BUFFING MACHINES

ACME *Manufacturing Co.*

1400 E. 9 MILE RD., DETROIT 20 (Ferndale) MICH.

Builders OF AUTOMATIC POLISHING AND BUFFING MACHINES FOR NEARLY HALF A CENTURY



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Northwest Chemical quality is equal to any in the field. Their formulas are based on careful research and long experience. The steady growth of the company and the acceptance of their products is due to the invisible ingredients compounded in each shipment going into a customer's plant.

Those ingredients which give Northwest Chemical customers a superior product are the careful, individual attention given each customer's requirements, expert analysis of the job to be done plus the technical ability and experience to produce basic formulas to exactly the point of top efficiency in each case and by constant stand-by service, to keep them that way.

That is the reason Northwest Chemicals are specified by an ever increasing number of the country's top manufacturers.

Remember—the cost per finished article is the true cost of your cleaner. Northwest's stand-by service keeps the job right.





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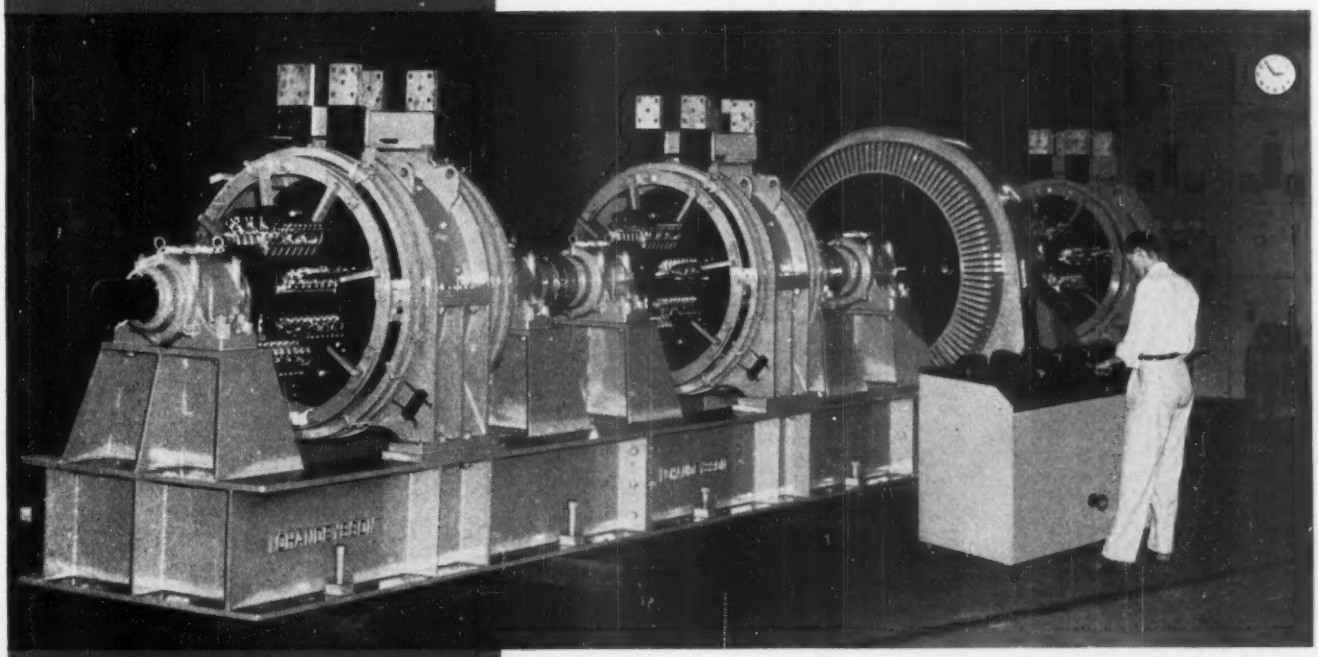
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are tested relentlessly to assure you a top-efficiency, low-voltage power supply

Before leaving our plant, each Chandeysson generator is run for at least 12 hours at 110% of voltage and 115% of current . . . simultaneously. Performance data is scrutinized by skilled engineers using the most modern electrical testing equipment.

Testing such as this is one reason for the remarkable dependability and high efficiency of Chandeysson equipment. In addition, unified responsibility for the manufacture of every component . . . from selected raw materials to the finished product . . . is in the hands of skilled men who have decades of experience in building low-voltage generators. Our aim in engineering is to *eliminate* design defects . . . rather than to correct for them. This is why more and more "Steel Industry Leaders Choose Chandeysson!"

MAKE US PROVE to you that a Chandeysson Motor Generator set is your most economical and dependable source of low-voltage dc . . . for tinning or any other electrolytic purpose. Mail this coupon today . . .

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DOW



Lift mechanism part for tractor takes cadmium finish smoothly after cleaning in caustic solution.

HIGHER POWER ALKALINITY AT LOWEST COST

Get Dow caustic flake for economical, thorough stripping

Anhydrous caustic flake direct from Dow . . . low cost, effective metal cleaning. These free-flowing, uniform flakes give users the very maximum in alkaline stripping power.

Full *supply* of this unmatched caustic flake is assured through Dow's multi-plant production: Midland, Michigan; Freeport, Texas; Pittsburg, California. Dependably prompt *delivery* is as certain, with Dow's extensive distribution network of terminals and regional stock points.

When a better stripping job at lowest cost can be yours for the asking . . . it's good sense to ask for Dow caustic flake. THE DOW CHEMICAL COMPANY, Dept. AL 753J, Midland, Michigan.

you can depend on DOW CHEMICALS

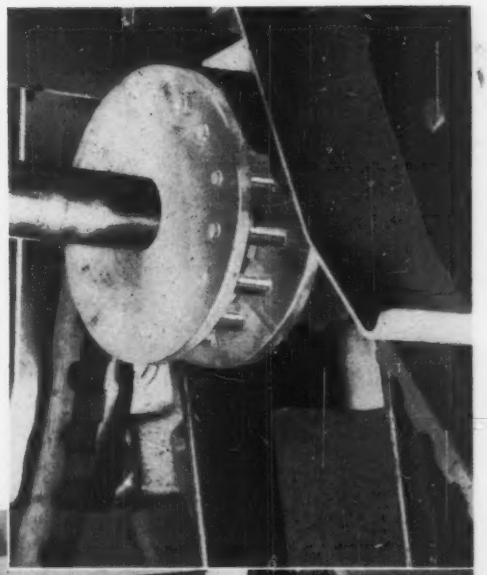
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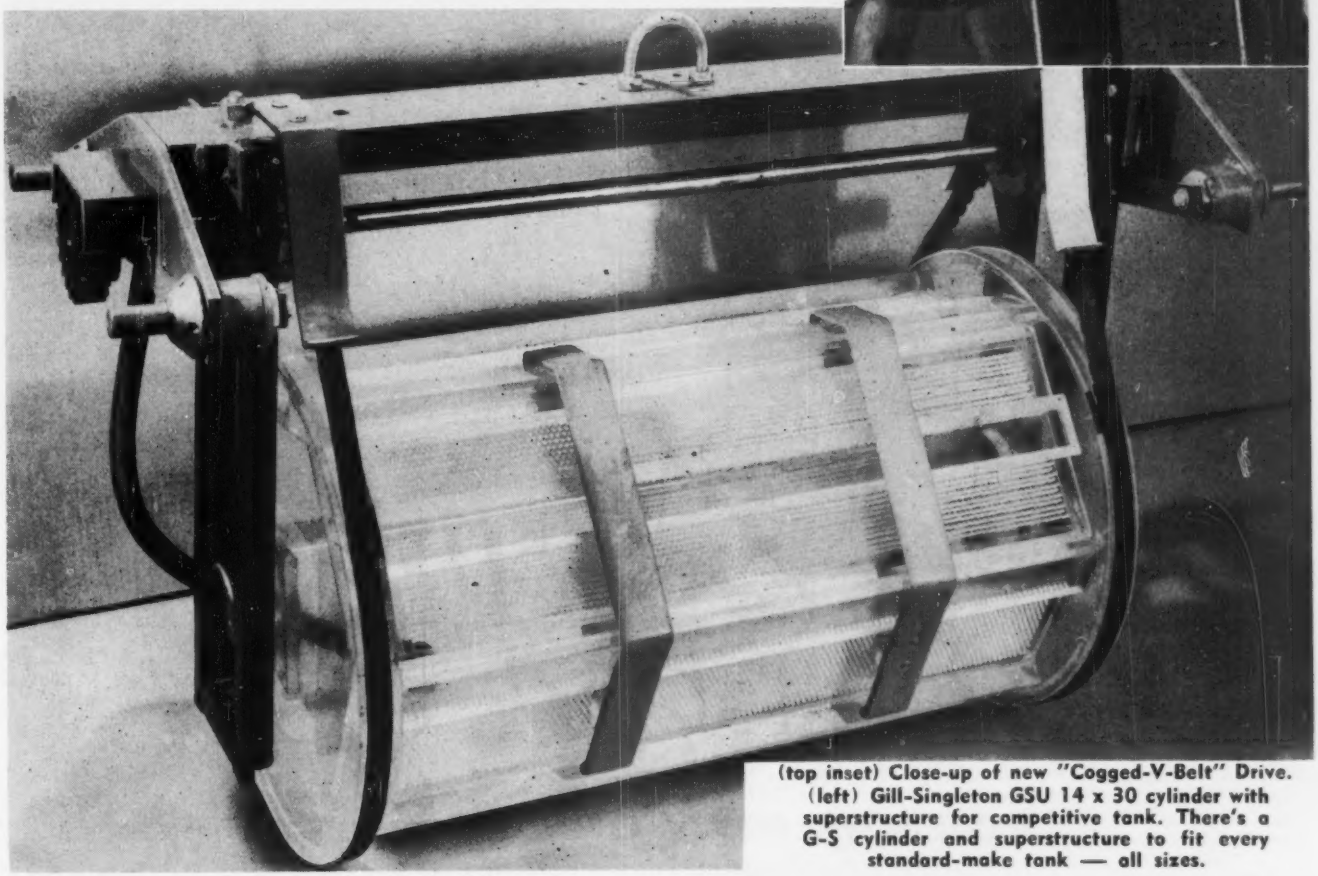
NOW ... the Belt-Drive with the "Gear-Grip"

New, Exclusive

GILL-SINGLETON "COGGED-V-BELT" DRIVE PLATING BARREL

U. S. Pat. 2,562,084. Other Pats. Applied For.





(top inset) Close-up of new "Cogged-V-Belt" Drive. (left) Gill-Singleton GSU 14 x 30 cylinder with superstructure for competitive tank. There's a G-S cylinder and superstructure to fit every standard-make tank — all sizes.

Positive transmission of power without costly gear maintenance. "Cogged-V-Belt" constant-meshed with cogged drive-pulley—can't slip, creep or vary speed

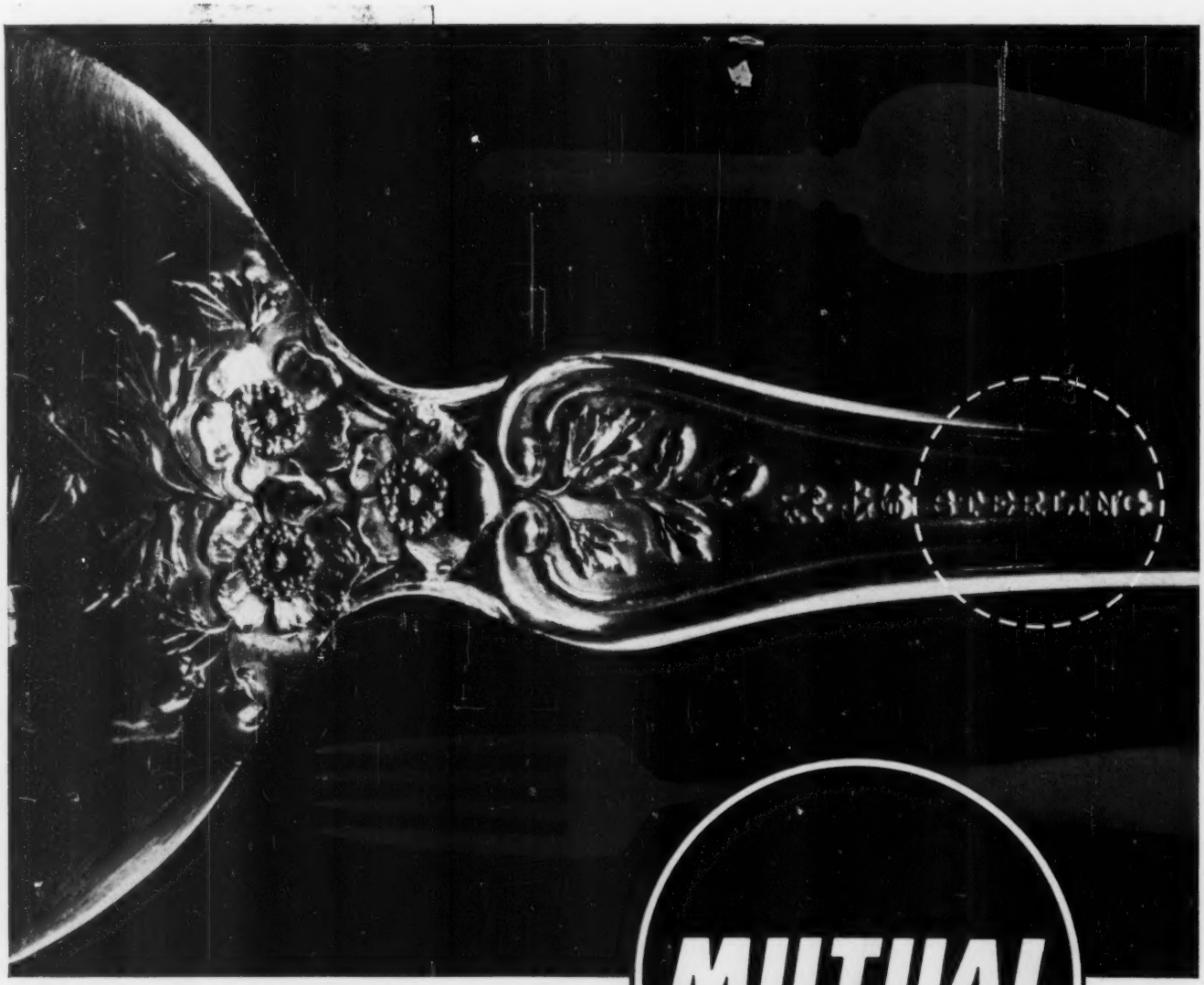
Here's positive control for new belt-drive plating. Another advance in the unique principle of operation by Gill-Singleton now revolutionizing barrel plating. For all loads — light or heavy — at any speed, under any conditions. G-S is the ***first*** and ***only*** V-belt drive that doesn't depend on friction-grip alone. "Cogged-V-Belt" meshes with matching cogs in H-T Sincolite Drive Pulley. Delivers constant, mechanical-type grip ***without gears***. Eliminates cylinder-end drive gear, idler gear, pinion gear and bearings which are usually immersed in solutions. Other exclusive features: "Locking U-Hubs" — danglers angled down through hubs won't ride up on load. Quick, easy changing of cylinder and danglers saves hours. Adjustable Bearings, Floating End Plates for constant contact — cylinder can't "rock" in saddles. Total cylinder immersion prevents explosions. Absence of equipment contaminants. H-T Sincolite Cylinder — heavy 2" ribs, fusion-welded — best for complete cycles, temps. to 200°F. See more features than ever before offered.

Send for Bulletin GSB 101 and Price List.



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The word 'sterling' means the best in quality silverware the world over. In fact, this word is the trade mark demanded by discerning people wherever fine silver is examined.

Likewise, users of Chromium Chemicals know exactly what our trade mark means. The word Mutual on any container of Chromium Chemicals stands not only for guaranteed top purity of the product itself, but also for the outstanding reputation of the Company. When you are in the market for Chromium Chemicals, look for the name Mutual, a symbol for quality.

Chromic Acid • Sodium Bichromate • Potassium Bichromate

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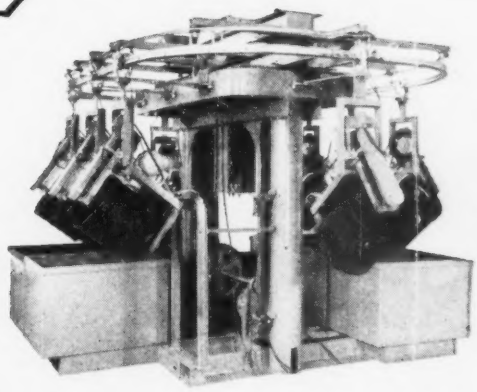
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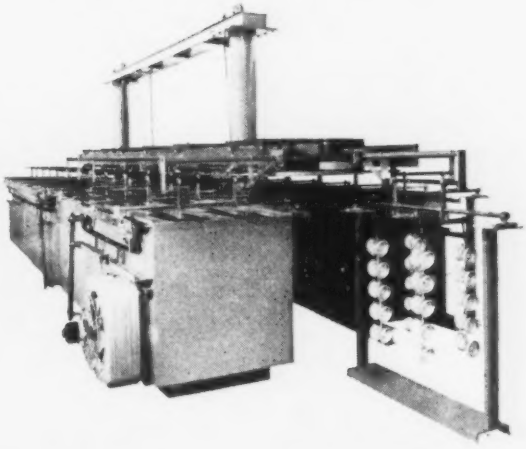
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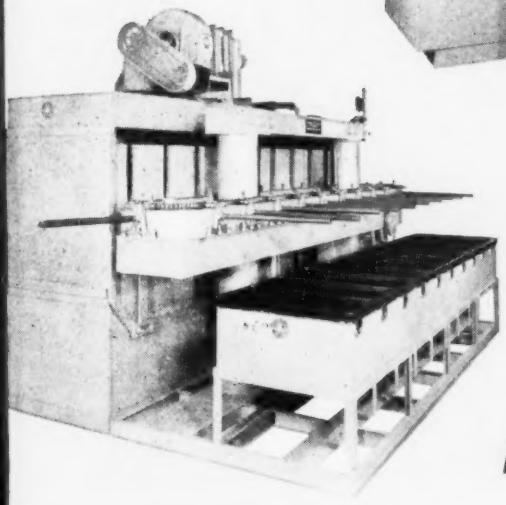
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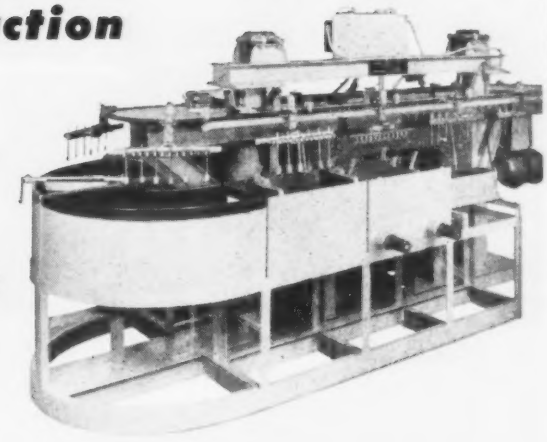


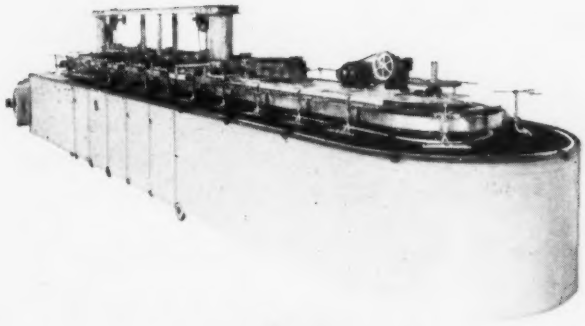


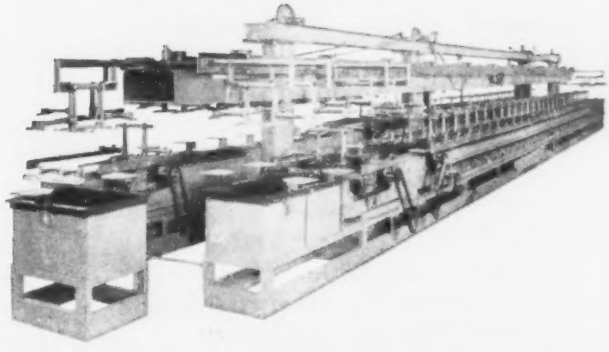
increase production

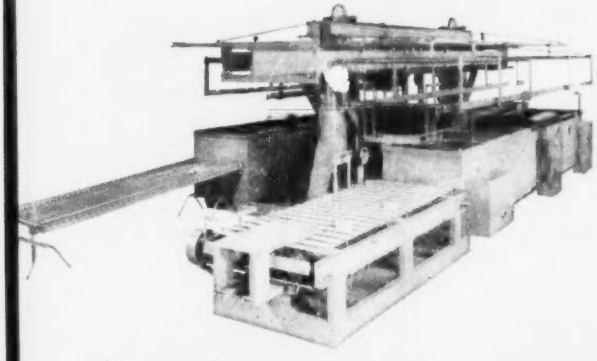
reduce costs

improve quality







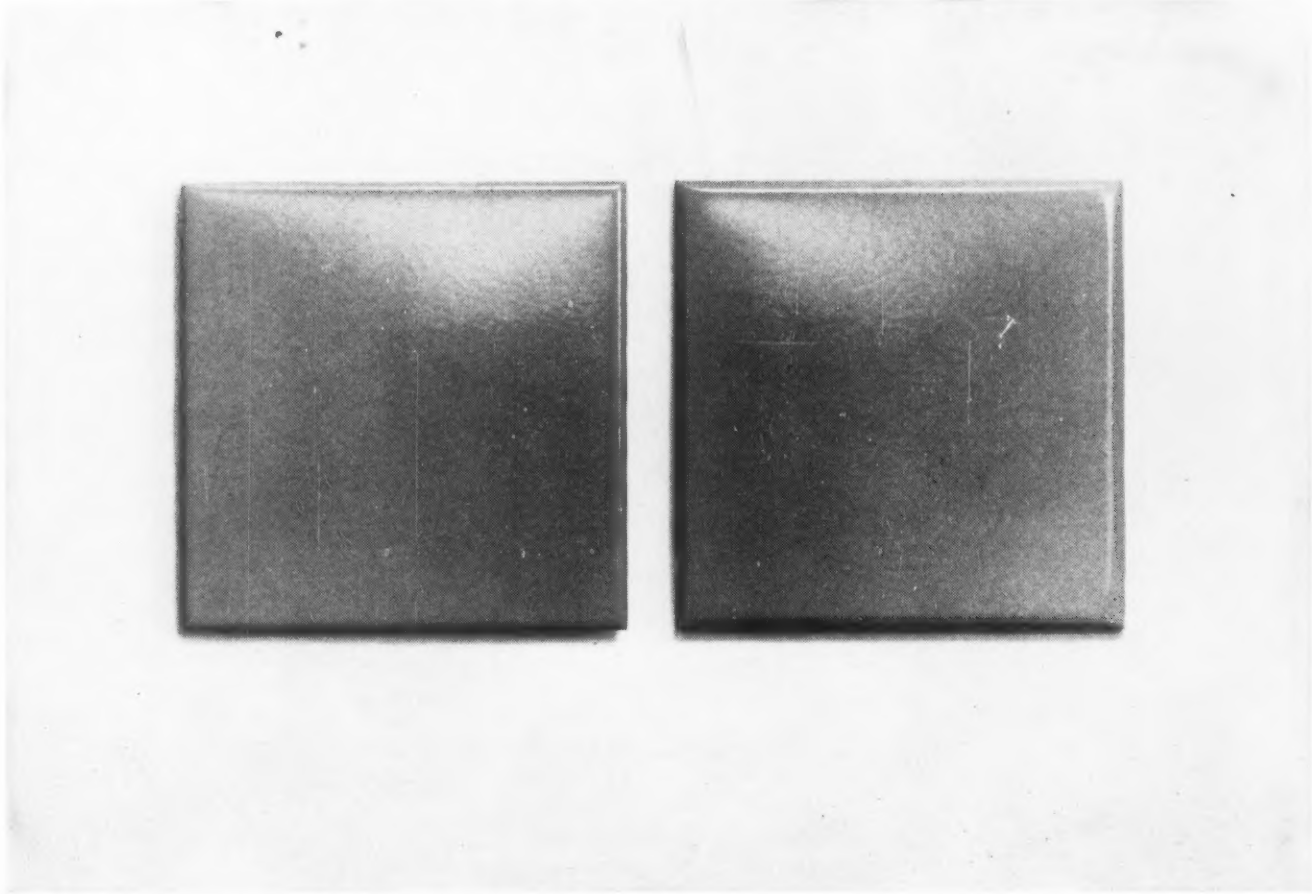


Crown Automatics are ideal for plating your barrel or racked work. Crown manufactures the widest variety of fully automatic plating machines in the industry . . . *there is a model to fit your needs.* Write us details of your job and production requirements.

CROWN RHEOSTAT AND SUPPLY COMPANY

3465 N. KIMBALL AVENUE • CHICAGO 18, ILLINOIS

Which porcelain-on-aluminum tile is prefired?



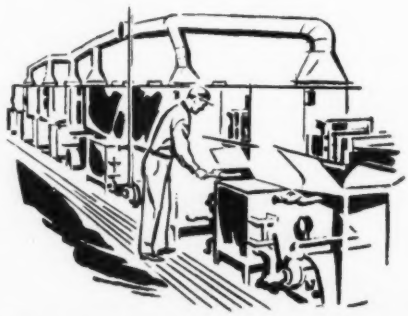
THE TILE AT THE LEFT HAS BEEN PREFIRED . . . the one at the right Alodized with Alodine and enameled without prefiring. Although the prefiring operation has been eliminated, there is no loss of quality in the finished product. This is another first for Vikon, which introduced porcelain-on-aluminum tile.

Vikon Tile Corporation applies Alodine® coating to eliminate prefire cycle—makes substantial saving without sacrificing the fine quality or the permanency of its porcelain-on-aluminum tile.

In the 6-stage Alodizing process developed by ACP for Vikon, the 3S aluminum half hard coil stock is cleaned, treated with Alodine 1200, and dried. Residues and contaminants are completely removed to provide a perfect base for the porcelain finish. And no expensive prefire operation is required to maintain the uniformly fine quality of the finish. Not only did ACP provide the method for preparing the aluminum strip for finishing, but it solved the problem of preventing contamination of the tile during the stamping operation.

Tests of finished tile have shown that there is no spalling and no fracturing of the porcelain. Color matching is no problem, and rejects due to contamination are extremely low.

Still another advantage of this newly developed process for the manufacture of porcelain-on-aluminum tile is offered by ACP. Its Service Department will make periodic inspection of the process in operation and of the equipment. And its Quality Control Laboratories will run tests of finished coupons. Both are free of charge — added services that keep the Alodizing process working effectively.



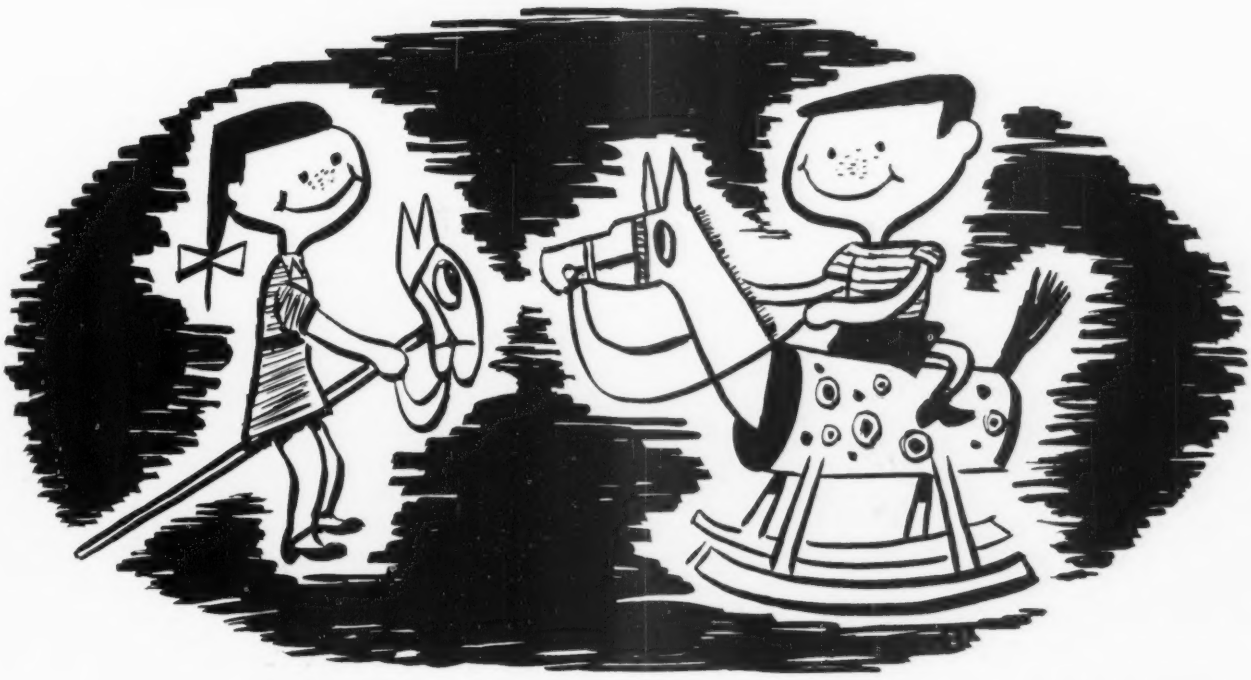
THIS 6-STAGE ALODIZING MACHINE cleans, treats and dries the 3S aluminum strip. Residues and contaminants are completely removed so as to provide a perfect base for the finish.

Write us for Bulletin 1241A. It gives complete information about Alodizing with Alodine

AMERICAN CHEMICAL PAINT COMPANY, Ambler 13, Pa.

DETROIT, MICHIGAN NILES, CALIFORNIA WINDSOR, ONTARIO

CHEMICALS ACP PROCESSES



LET'S TALK TRADE

TRADE YOUR NICKEL RESIDUES FOR NICKEL ANODES

YOU

Produce nickel residues in the form of peelings, strippings, hangers, racks, baskets, etc. . . . WE WANT THEM.

WE

Will trade cathodes, butts, swords, clips, rods, etc., that will meet your regular supplier's specifications for recasting into anodes; or, we can supply cast or rolled anodes. . . . YOU WANT THESE.

PHONE, WIRE, WRITE . . LET'S TALK TRADE

Stainless Steel Corp. of America

OHIO EDISON BLDG. · YOUNGSTOWN 3, OHIO

Riverside 4-4123



Shoot your chrome questions at Diamond

Let DIAMOND's technical specialists zero in on your chrome-plating problems. These specialists are ready and able to handle your questions—quickly and completely. Their service is free.

In making chromic acid, DIAMOND controls quality from start to finish. DIAMOND experience begins with importing the chrome ore and making the soda ash. It includes *every step* through production and delivery, right up to standing by your side, if you wish, to help you get top-quality plating results consistently, economically.

DIAMOND facilities—two chromic acid plants and nine warehouses and sales offices across the country—assure you uninterrupted supply. DIAMOND ALKALI COMPANY, 300 Union Commerce Building, Cleveland 14, Ohio.

DIAMOND ALKALI CHEMICALS

Diamond Chromic Acid



NEW!
DIFFERENT!
--but Production Proven

These three numbers are available in new, longer, "nubbin saving" containers. They are manufactured up to 100% saponifiable, resulting in easier cleaning, quicker acting and cost cutting compositions for you. Try these new time savers now, Mr. Polishing and Buffing Superintendent.

Call collect or write for your free samples and prices pronto!

Clip To Your Letterhead

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Schaffner
manufacturing company, inc.
SCHAFFNER CENTER, EMSWORTH, PITTSBURGH 2, PA.

Please send me more detailed information about your new buffing compounds. I would also like to have your free sample(s) of
☐ LIME ☐ GREASE STICK ☐ STAINLESS

Name _____

Title _____

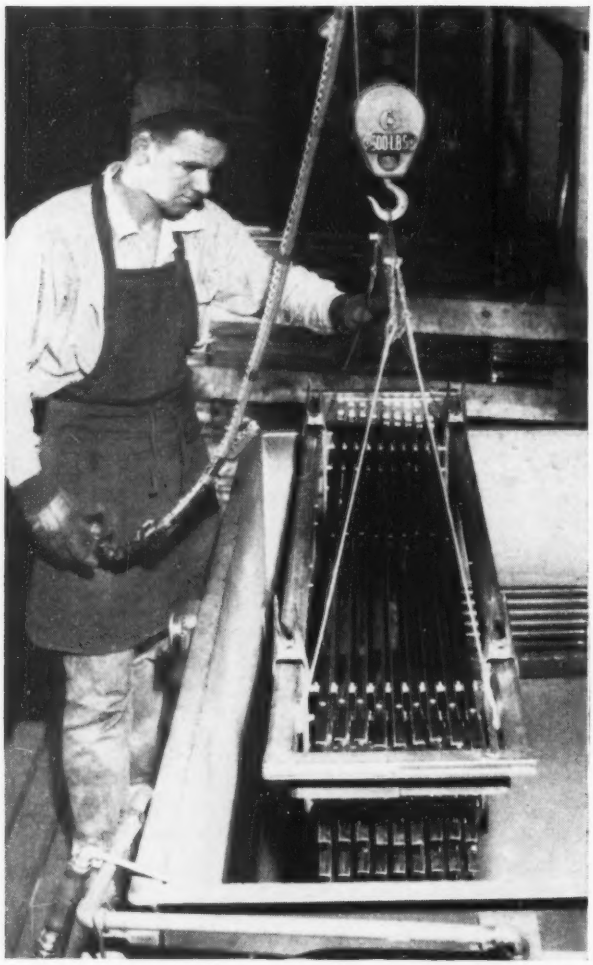
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Street _____

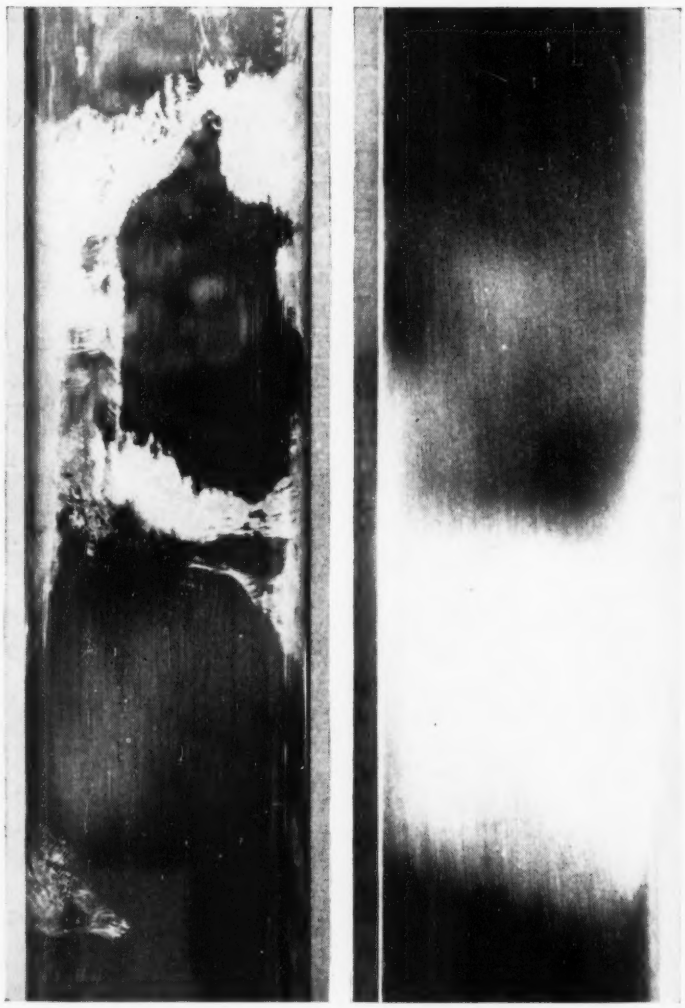
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"Schaffner Bros. make things shine"
Bob — Paul — Gus

Schaffner
manufacturing company, inc.
EMSWORTH, PITTSBURGH 2, PA.



ALUMINUM shower enclosure parts are removed from the degreaser at Hecker Manufacturing Company, San Francisco, California. Buffing compound sludge and dirt are removed rapidly by vapors of "TRICLENE" D trichlorethylene.



CLOSEUP of aluminum parts before and after cleaning with "TRICLENE" D. Note bright, stain-free appearance of the highly polished aluminum.

"No etching of aluminum with TRICLENE® D in the degreaser"... *says Clyde Cary, Plant Superintendent,* HECKER MFG. COMPANY

"... and with 'TRICLENE' D trichlorethylene, there's no more adding stabilizers." Mr. Cary goes on to say, "What's more, we've been able to increase the time between degreaser cleanouts from every 3 or 4 days to 2 weeks."

Aluminum parts of these attractive modern tub and shower enclosures are highly polished, and when the degreasing solvent formerly used developed a high acid content—a frequent occurrence—rejects due to etching and staining mounted. Frequent degreaser cleanouts were necessary, and a close watch had to be kept over the solvent pH.

"Since changing to 'TRICLENE' D," Mr. Cary concludes, "we've noticed a big reduction in the number of rejects ... and we have no solvent control problem at all. All this adds up to real savings in maintenance and production costs."

Locked-in stabilizers give "TRICLENE" D unsurpassed resistance to all major causes of solvent deterioration—heat, light, air, acids and aluminum chloride—yet this rugged solvent contains nothing to harm even delicately machined metal surfaces. "TRICLENE" D gives brighter cleaning of any metal, distillation after distillation ... yet it costs no more!

FOR MORE INFORMATION on "TRICLENE" D and how it can bring a new standard of efficiency to your vapor-degreasing operation, write: E. I. du Pont de Nemours & Co. (Inc.), Electrochemicals Dept., Wilmington 98, Delaware.

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING ... *THROUGH CHEMISTRY*

TRICLENE® D

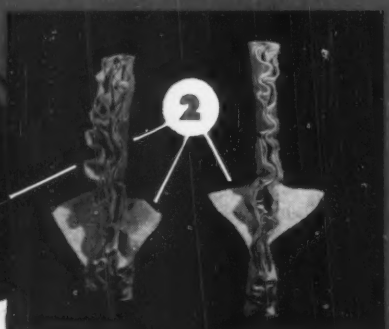
TRICHLORETHYLENE

No other Buff...

has all these advantages

CODMAN NON-FRAY BUFFS

1. THICKNESS OF RING VARIES DENSITY
2. TRAILING ENDS — (Safety)
3. NON-COMPRESSIBLE CONSTRUCTION
4. NON-METALLIC CENTER — (No Shaft Scoring)



OPEN FACE CLOSED FACE

Available-Closed or Open Face Ventilated, Of Course, When Necessary

F. L. & J. C. CODMAN COMPANY

ROCKLAND, MASSACHUSETTS

the greatest name in buffs for over 55 years

BRANCH OFFICES — PHILADELPHIA, DETROIT, LOS ANGELES, INDIANAPOLIS, GRAND RAPIDS

NEW SHAPED, EXTRUDED APW SILVER ANODES



*Pat. Pending

CONTROLLED GRAIN SIZE: APW EXTRUSION PROCESS* controls grain size within definite limits—minimizes sheddings

The new APW Extruded, Shaped Anodes provide two very definite and important advantages:

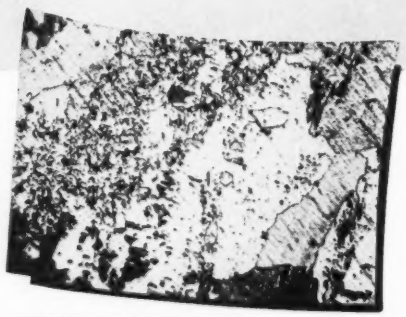
Through controlled grain size, they virtually eliminate shedding and all of its costly results in electroplating.

Their scientifically determined "shapes" prolong considerably the useful life of the anode—with appreciable savings in costs.

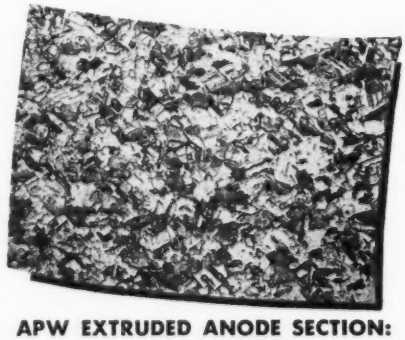
The small and uniform grain size produced in the new APW Extruded Anodes is controlled between definite ideal limits. Corrosion is smooth and uniform for consistently smooth electrodeposits. Rejects are a comparative rarity!

The distribution of mass material in the scientifically designed shapes help to maintain a more efficient ratio between anode weight and active surface area. After 85% by weight has been plated off, this APW Anode retains 80% of its original active surface area. You profit with the longer useful life of the anode . . . polarization is minimized . . . there is less silver scrap to be refined.

To be certain the silver you buy in anodes is used most efficiently, APW will develop special anode shapes to meet particular plating bath conditions. We would be pleased to have you consult us on any anode problems you may have.



ROLLED FLAT PLATE ANODE SECTION:
This Photomicrograph shows highly irregular, uncontrolled grain size—a major cause of shedding and resultant rough electrodeposits.

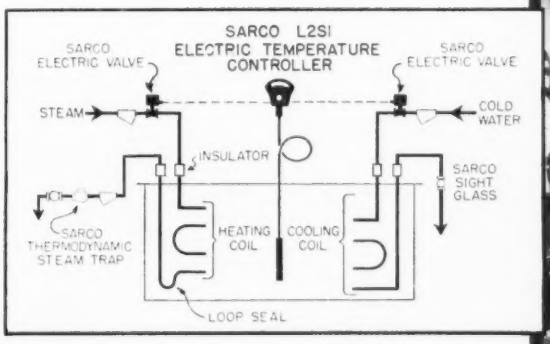


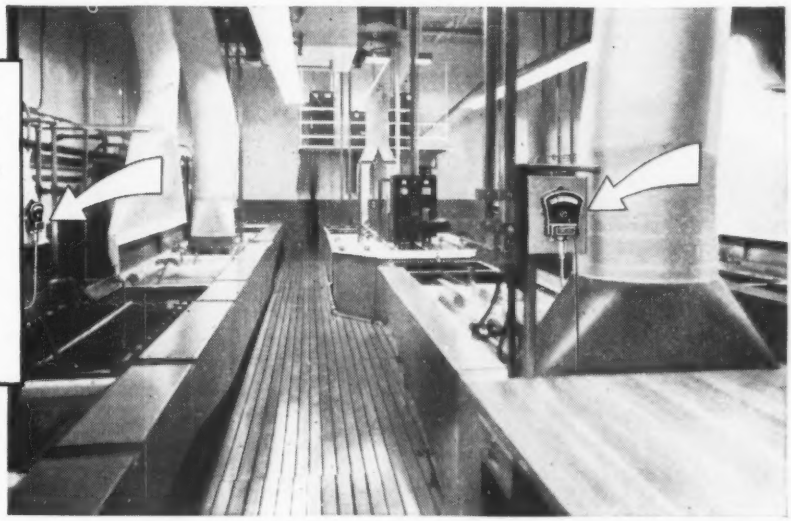
APW EXTRUDED ANODE SECTION:
Note small, fully controlled regularity of grain size that promotes uniform corrosion, smoothest electrodeposits, less rejects.

THE AMERICAN PLATINUM WORKS

APW

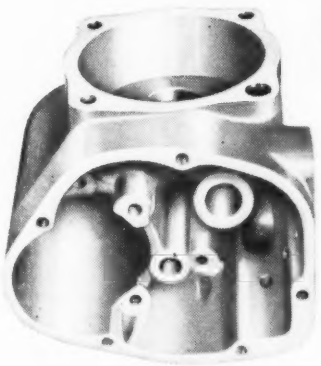
231 NEW JERSEY RAILROAD AVENUE • NEWARK 5, NEW JERSEY





Scientific plating department of Woodward Governor Co., Rockford, Ill., meets exacting government specifications. All plating and cleaning process tanks are equipped with Sarco Electric Indicating Temperature Controllers.

Tough precision plating problem solved by low-cost Temperature Control



0.0002" tolerance held by Woodward Governor in plating irregular and deeply recessed surfaces

PROBLEM—Look at the above case for an aircraft propeller governor. Its irregular shape and deep recesses present a tough plating problem.

Furthermore, Uncle Sam specified a top quality plate with a thickness tolerance of 0.0003 to 0.0005 inch... to assure mating of parts.

SOLUTION—Key to the solution of this precision plating problem is control of all the variables...and by far the most important is *bath temperature*. When it fluctuates, so does the plate quality... current density is affected...and, therefore, throwing power varies, causing uneven plate thickness.

That is why *all* Woodward Governor plating tanks are equipped with Sarco Electric Indicating Temperature Controllers, which automatically hold the plating solutions to $\pm \frac{1}{2}$°F.

RESULTS—A top-quality deposit. Throwing power that assures uniform plating thickness on all surfaces... plane, irregular and recessed. Tolerance of 0.0002 inch... actually closer than government specifications. Minimum rejects.

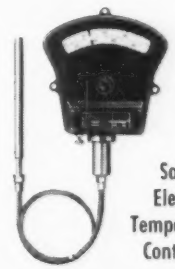
Mr. Delbert L. Zeigler, plant manager of Woodward Governor, writes: "Sarco Electric Temperature Controls are doing an excellent job in every way."

Write for Handbook No. 6 or consult your plating supplies jobber. Sarco Company, Inc., Empire State Bldg., New York 1, N. Y.

2130-B

SARCO

improves product quality and output



Sarco Electric Temperature Controller

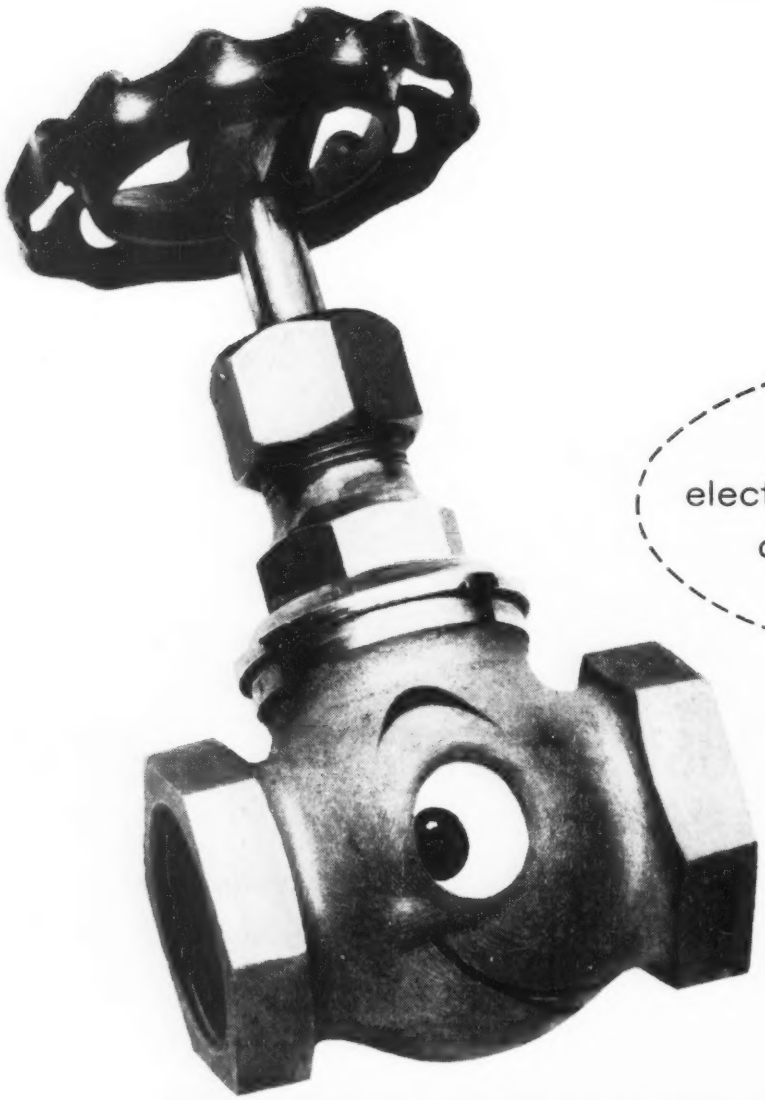
ADVANTAGES FOR ALL TYPES OF PLATING

LOW COST—about $100

EASY ADJUSTMENT—turn one knob to change temperature setting

ELIMINATES DIFFICULTIES often caused by unreliable manual temperature control:

- Changes in current density
- Variations in plate thickness
- Variations in quality
- Dull finishes
- Breakdown of plating solutions
- Crystallization of salts
- Rejects



NOW!
electroless nickel plating
of intricate insides
with . . .

PFIZER SODIUM CITRATE

as your sequestering and buffering agent

Complex-shaped interiors, found in many valves and pipes, frequently are beyond the throwing power of an electroplating bath. Such equipment can be successfully plated without electricity by *electroless* nickel plating using Pfizer Sodium Citrate. This ideal buffering agent produces brighter plate in the alkaline bath and as a sequesterant prevents wasteful precipitation of basic nickel salts.

Other Pfizer chemicals of interest to metal finishers include: citric, tartaric, gluconic and oxalic acids, and their salts. Get the full details on how they help you do a superior job of cleaning, polishing and plating.

CHAS. PFIZER & CO., INC., Chemical Sales Division, 630 Flushing Ave., Brooklyn 6, N. Y.

Please send me the items checked:

- ☐ Technical Bulletin 68, "Electroless Nickel"
- ☐ Technical Bulletin 61, "Chemicals for Metal Finishing"

MF

NAME_____

POSITION_____

COMPANY_____

ADDRESS_____

CITY_____ **ZONE**_____ **STATE**_____

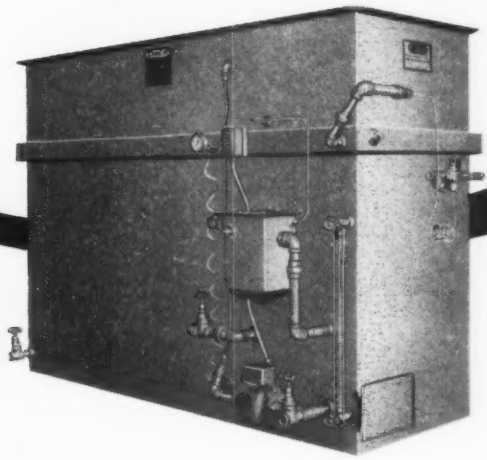
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Pfizer

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Branch Offices: Chicago, Ill.; San Francisco, Calif.; Vernon, Calif.; Atlanta, Ga.

The CIRCO *degreaser!*
revolutionary new design means:

30% LESS SOLVENT!
40% LESS MAINTENANCE!
LASTS TWICE AS LONG!



No other degreaser has ALL these features:

CORROSION RESISTANT COILS Condensate coils are one-piece spiral copper tubing with nickel plated exterior surfaces. Exterior resists degreasing solvents and hydrolysis . . . interior is superior to galvanized pipe for water transport.

RECESSED CONDENSING COILS Condensing coils are recessed and placed directly over the storage tank, providing smooth, obstruction-free walls and easy operation.

DOUBLE THE LIFE Water condensation and resultant hydrolysis will not take place along sides, causing them to rust. No rusty condensate troughs to patch or replace . . . a tremendous improvement, doubling the life.

LEAK-PROOF PUMP Circo's new pump has performance, corrosion resistance, longevity and non-leaking qualities. All pumping parts are fabricated of stainless steel . . . the rotor and end plates are nickel clad. The new Circo pump, without stuffing box, rotary seals, coupling drive sheaves, or V belts, uses a rotating magnetic field to drive the impeller, and is virtually foolproof. It's safely sealed—leaking is impossible.

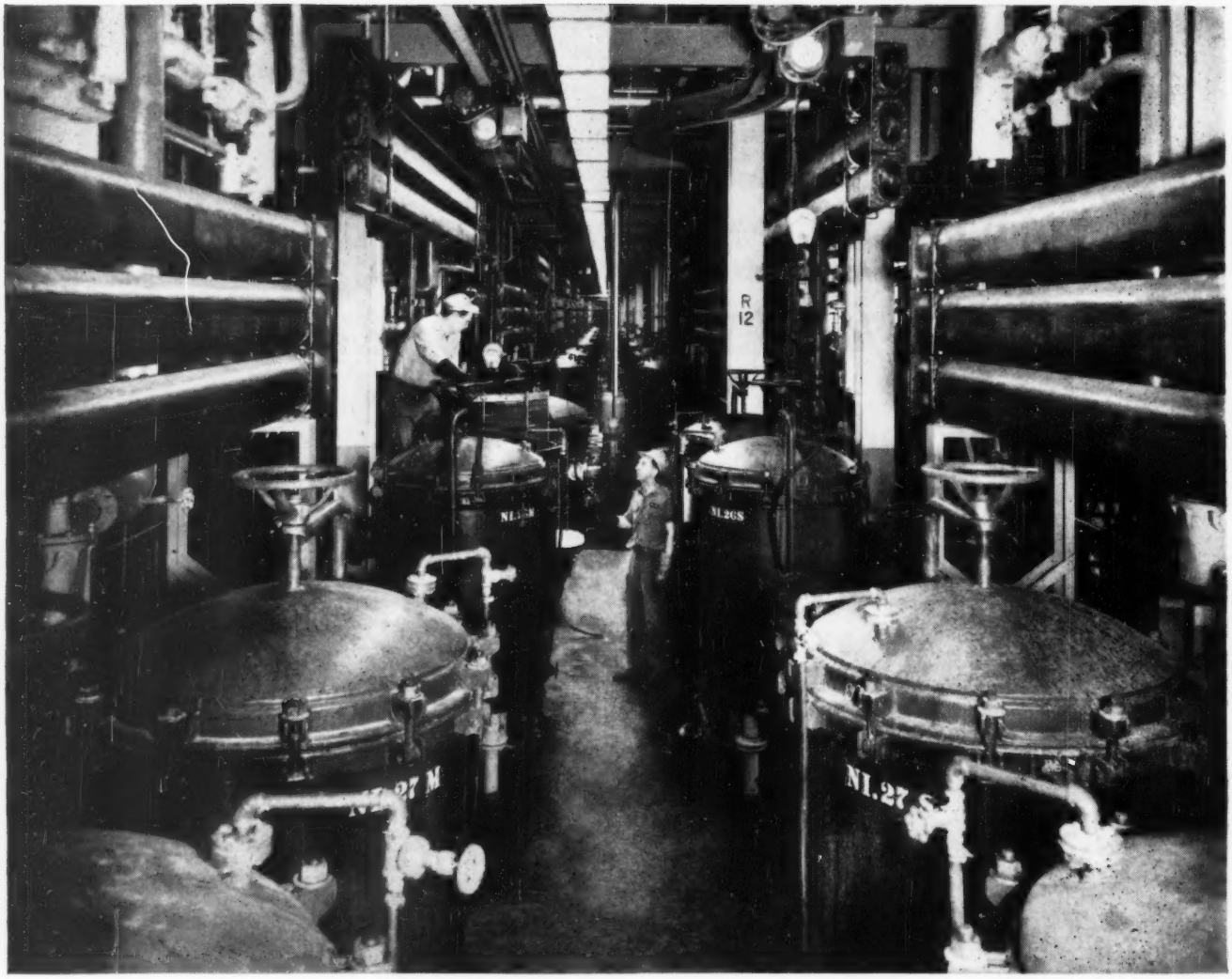
DEMAND TYPE WATER CONTROL A water temperature regulator to accurately control water in the coil and insure a 90° to 120° F. temperature for water entering the water jacket, eliminates water condensation which would result in hydrolysis, rusting and acid solvent.

CIRCO DEGREASERS for every need are available in corrosion-resistant compact units for the small shop, large automatic models for mass production, and all sizes between. Sturdy and dependable vapor, solvent-vapor-solvent, vapor-spray and ultrasonic models make Circo the standard for performance and long life.

Complete information on request.
Bulletin OP2 on solvent degreasers
Bulletin UC1 on ultrasonic equipment
Bulletin 521 on metal washing equipment

CIRCO EQUIPMENT COMPANY CIRCO *Since 1923*

51 Terminal Avenue. Clark (Rahway), New Jersey
OFFICES IN PRINCIPAL CITIES • NATION-WIDE ENGINEERING FIELD SERVICE



48 Sparkler Horizontal Plate Filters in this installation

Why do the largest plating plants in the world Choose SPARKLER FILTERS?

The answer is simple, and obvious to plating engineers.

First — the cake on a Sparkler Horizontal plate filter will not crack or fall off with a variation in pressure or with a complete shut down of filtering. ***Second*** — dry cake disposal eliminates the sewer problem. ***Third*** — the quick-change plate assembly reduces the down time for cleaning each filter to a matter of minutes.

This is why many of the world's largest plating plants use Sparkler Filters exclusively.

Plating engineers can get full cooperation at Sparkler on any size installations.

SPARKLER MANUFACTURING CO., Mundelein, Ill.

Filtration engineering and manufacturing has been our exclusive business for over 30 years

Manufacturing plants in Canada, Holland, Italy, Australia

Service representatives in principal cities throughout the world



ELECTROPLATERS:

"Blast" off heaviest smuts

with PENNSALT ELECTROCLEANER K-8

Pave the way to a smooth, bright plate with minimum rejects—use Pennsalt Cleaner K-8*, the KING OF ELECTROCLEANERS.

The high conductivity of K-8 lets high currents flow at moderate voltages, produces a strong electrolytic "scrubbing" action that removes the most stubborn heat-treating smuts, impacted mill oils, and drawing compounds. A new combination of surfactants and balanced alkalies in K-8 gives you cleaner steel or copper for a consistently better plate. And, once removed, soils are prevented from redepositing; suspended by the K-8 solution, they're easily rinsed off even in hard water.

Remember—where other cleaners fail, Pennsalt Electrocleaner K-8 cleans deep and sure. TRY K-8 IN YOUR CYCLE. Ask the Pennsalt man for a demonstration, or write Metal Processing Dept. 234, Pennsylvania Salt Manufacturing Company. East: Three Penn Center Plaza, Philadelphia 2, Pa.; West: Woolsey Building, 2168 Shattuck Ave., Berkeley 4, Calif. In Canada: Pennsalt Chemicals of Canada, Hamilton, Ontario.

*PENNSALT K-8 IS A TRADEMARK OF PENNSYLVANIA SALT MFG. CO.

Pennsalt Chemicals

Metal Cleaners • Phosphate Coatings • Cold-Working Lubricants

A BETTER START FOR YOUR FINISH

DAVIS-K GOLD PLATING SOLUTIONS

. . . Will Save You Time!

. . . Will Save You Money!

. . . Are Unconditionally Guaranteed!

Davis-K, through constant research and quality control methods, has consistently maintained its position as a leader in the metal plating field.

ALL DAVIS-K Gold Plating Solutions Are:

- Made in all colors
- Color-constant
- Tarnish-Resistant
- Brilliant in Finish
- Bottled by Troy weight
- Made from assayed US Treasury Gold only
- Ready for immediate use

NOW AVAILABLE — Variable-type Tank Rheostats . . . . specifically designed for precious metal plating.

New! HARD GOLD SOLUTION

Used and Endorsed by Leading Electronic Manufacturers

America's foremost electronic manufacturers give their unqualified approval to this New Hard Gold Solution, which Davis-K developed specifically for printed circuits and electronic parts.

This amazing new product cuts gold deposit 50%! It has maximum resistance to contact and abrasion, high throwing power, low resistance to high frequency, and metal and plastic remain firmly bonded. New Hard Gold Solution presents no control problem and it plates at low temperatures.

Small samples will be plated at no charge.

- **POTASSIUM GOLD CYANIDE SALTS**
- **LUSTROUS WHITE RHODIUM SOLUTION**

We are fully equipped to reclaim old gold and rhodium solutions.

ONE OPERATION

Antique Gold Solution

A QUALITY SOLUTION, with excellent color consistency and remarkable ease of operation. No production problems — truly economical, too!

"Where Glittering Elegance Reflects Lasting Quality."

100% PURE GOLD DKP SOLUTIONS

DAVIS-K PRODUCTS, CO.

135 West 29th St., New York 1, N. Y.

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Another fine product made finer . . .



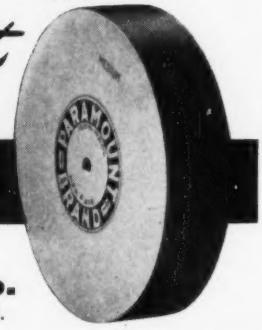
with the PARAMOUNT "Finishing Touch"

"Fine finishes are essential to the sales success of our products," says L. E. Mason Co., leading manufacturer of quality gifts. "To highlight the copper plated and oxidized finish of the coasters, we depend on Paramount Felt Bobs. We get the precise color we want with no 'ragged highlighted ends' and without destroying contrast between the oxidized backgrounds and highlights. Your bobs give good cut, good life while producing the fine finishes we demand."

Wherever fine finishes count, successful firms use Paramount Wheels and Bobs. Join the leaders — specify Paramount. Call your supply house.

Paramount

Felt Wheels, Bobs, Sheet Felt



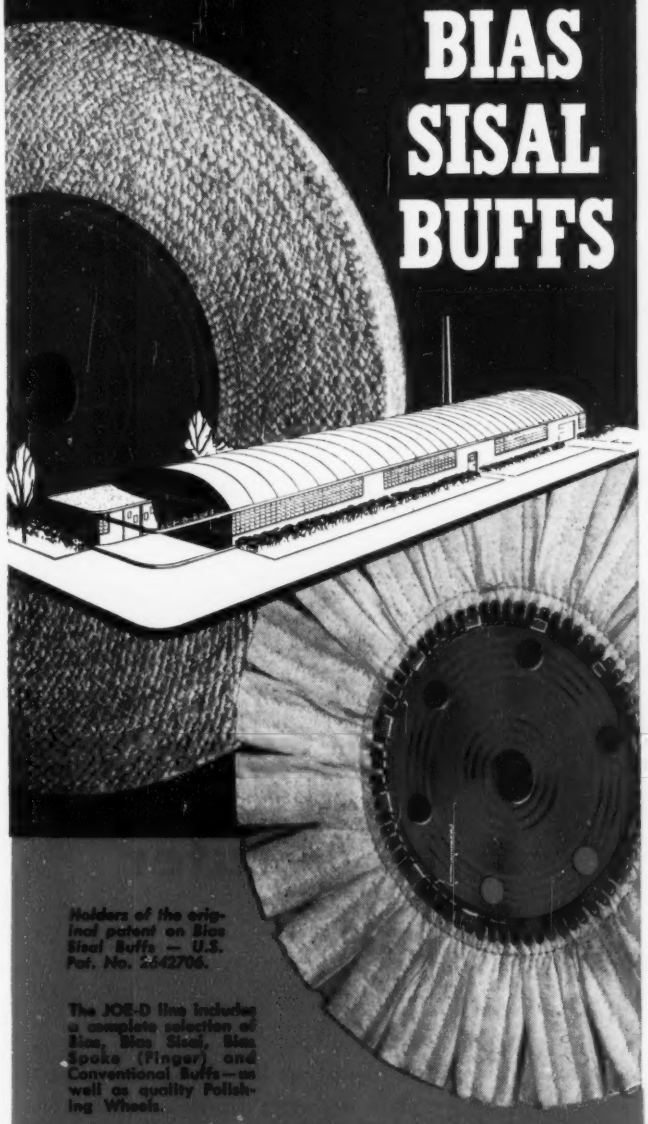
Bacon Felt Co.

437 West Water St., Taunton, Mass.

The "House that Sisal Built"

JOE-D ... Originators of

BIAS SISAL BUFFS



Holders of the original patent on Bias Sisal Buffs — U.S. Pat. No. 2542706.

The JOE-D line includes a complete selection of Bias, Bias Sisal, Bias Spoke (Finger) and Conventional Buffs—as well as quality Polishing Wheels.

Since its founding, the JOE-D Buff Company has specialized in Sisal — constantly experimenting and testing ways to give you faster-cutting, longer-lasting Sisal Buffs. Made of the finest quality imported sisal, specially woven and processed for guaranteed fray-proof performance . . . never a loose end to whip or scratch . . . always an even nap to hold compound and provide better color. For every Sisal Buff requirement, specify JOE-D, the original — and still America's finest — Bias Sisal Buff!

ATTENTION JOBBERS: Some choice territories still available. WRITE TODAY!

the JOE-D Buff Company

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Just ONE phone call...



ALL your finishing needs!

CALL HOLLAND FOR

IMMEDIATE DELIVERY

one of the world's largest

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of POLISHING equipment

PLATING equipment

SPRAY equipment

...and supplies

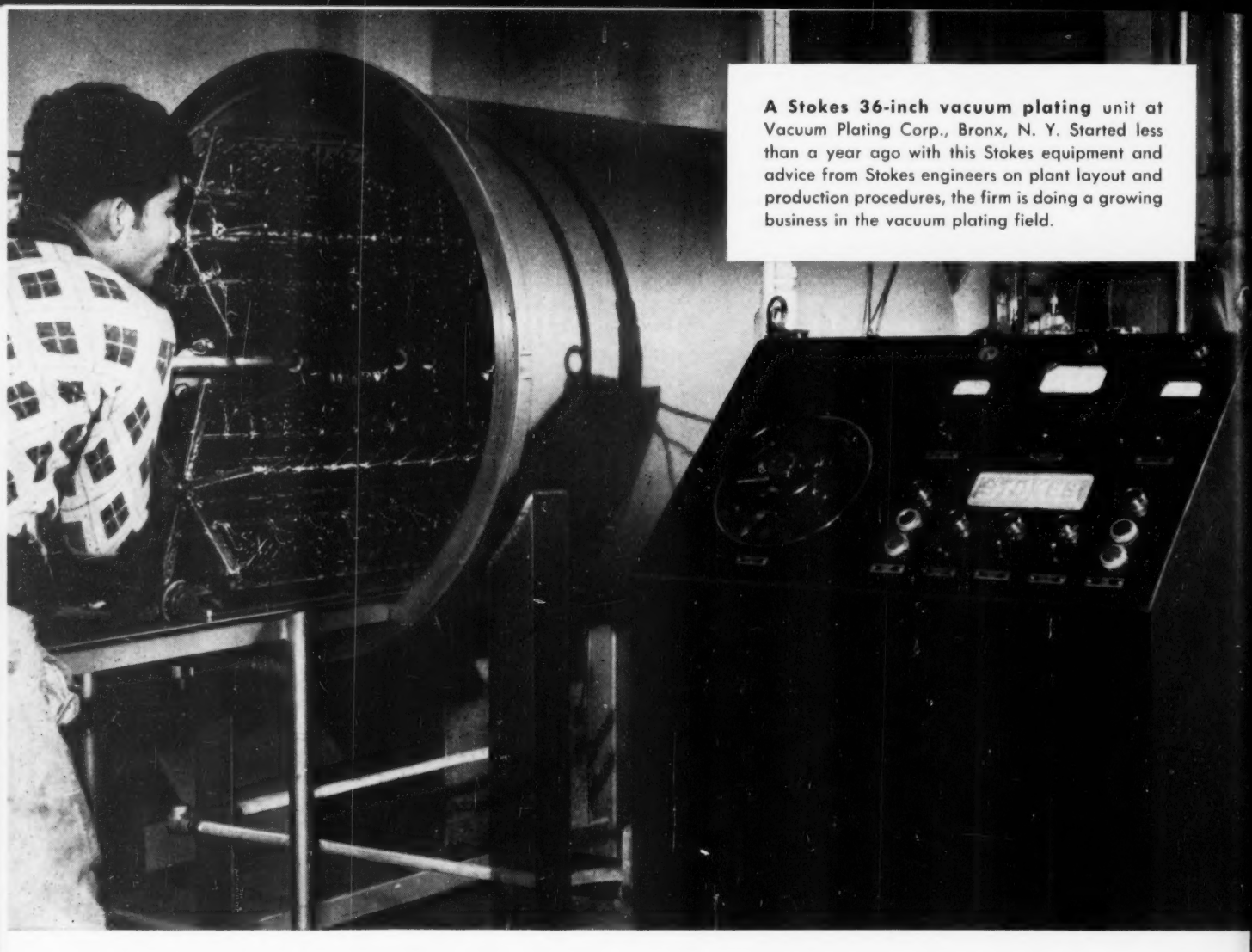
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J. HOLLAND & SONS, INC.

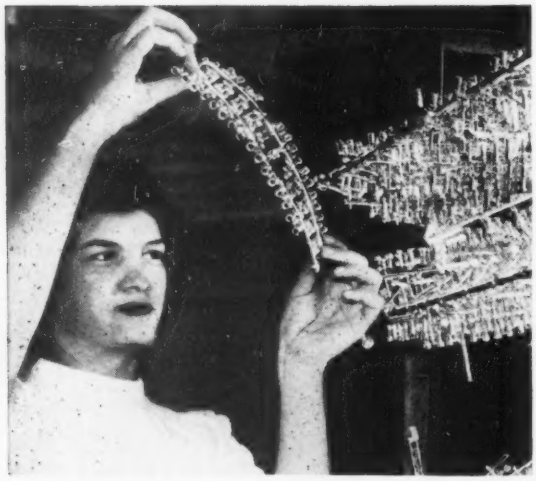
Leaders in finishing equipment for over half a century

475 Keap St., Brooklyn 11, N. Y. • TEL: EVERGREEN 7-3315



A Stokes 36-inch vacuum plating unit at Vacuum Plating Corp., Bronx, N. Y. Started less than a year ago with this Stokes equipment and advice from Stokes engineers on plant layout and production procedures, the firm is doing a growing business in the vacuum plating field.

The first high-production vacuum plater selling for less than $10,000



Brilliant, durable plated parts are produced in quantity at Vacuum Plating Corp.

For firms just entering the vacuum plating business or for those expanding their operations in this growing finishing field, the Stokes 36-inch vacuum plating unit offers unusual advantages:

1) Low cost
2) Fast, 15-minute over-all cycle time
3) Simplified, push-button operation
4) High capacity...200% greater than conventional 30-inch units
5) Interchangeability...the four part racks can be used in larger Stokes units, if operations demand more capacity.

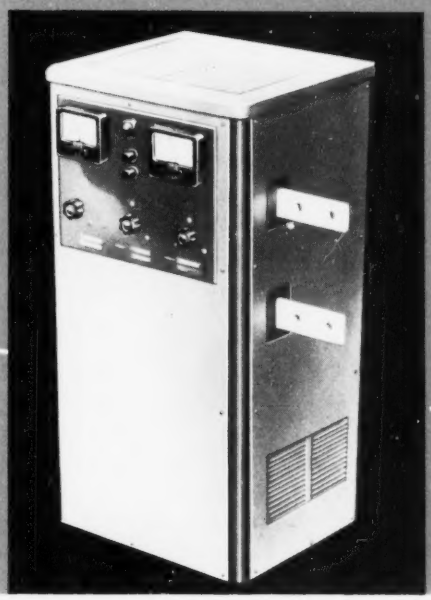
Stokes builds vacuum plating equipment in 24, 48 and 72-inch sizes as well. Our vast experience in the application of this popular finishing method is at your service, to plate your sample parts and advise on efficient plant layout. Send for an informative brochure on the Vacuum Metallizing Process, Catalog 780.

F. J. Stokes Machine Company
5531 Tabor Road, Philadelphia 20, Pa.

OFFICES IN PRINCIPAL CITIES, REPRESENTATIVES THROUGHOUT THE WORLD

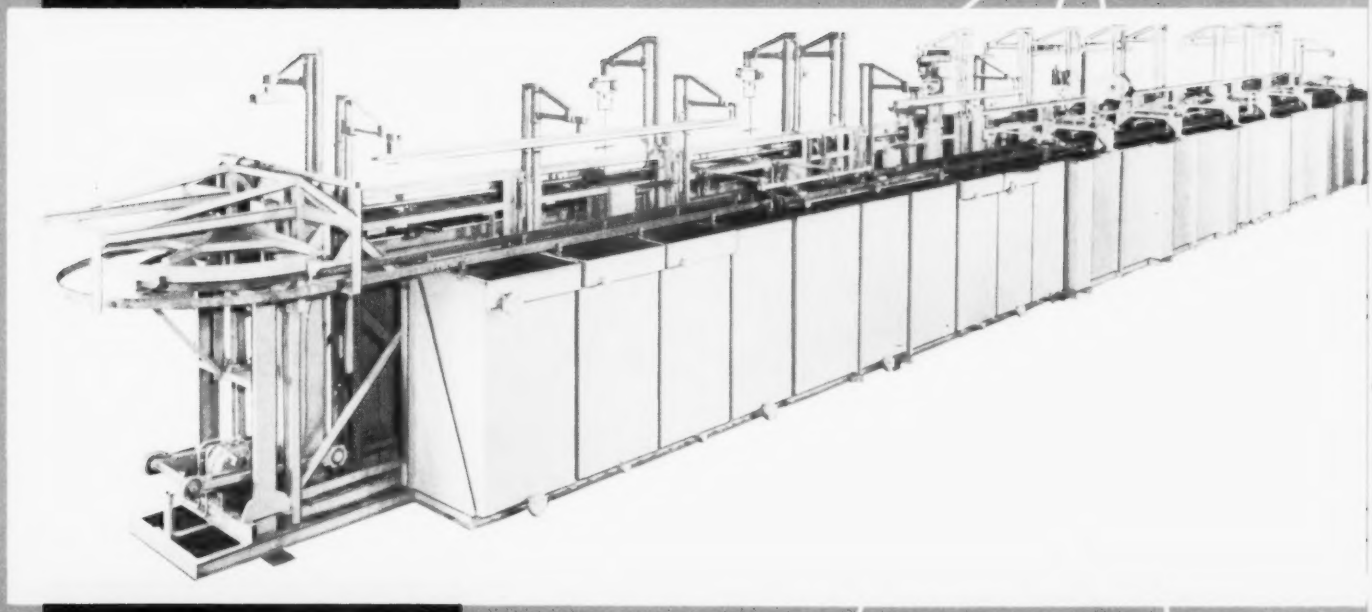
STOKES

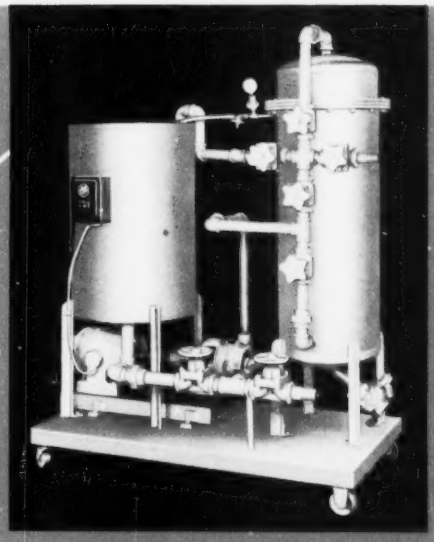
BULLETIN 655



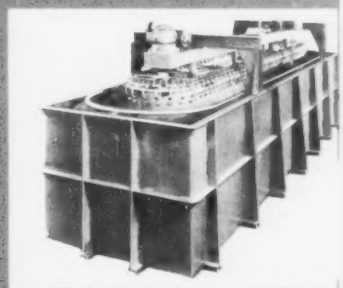
tomorrow's equipment today

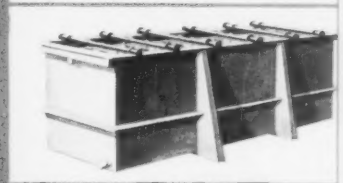
WAGNER BROTHERS
automatic plating equipment and supplies





RECTIFIERS
AUTOMATICS
SEMI-AUTOMATICS
FILTERS
TANKS & LININGS
ANODES
WASTE TREATMENT SYSTEMS



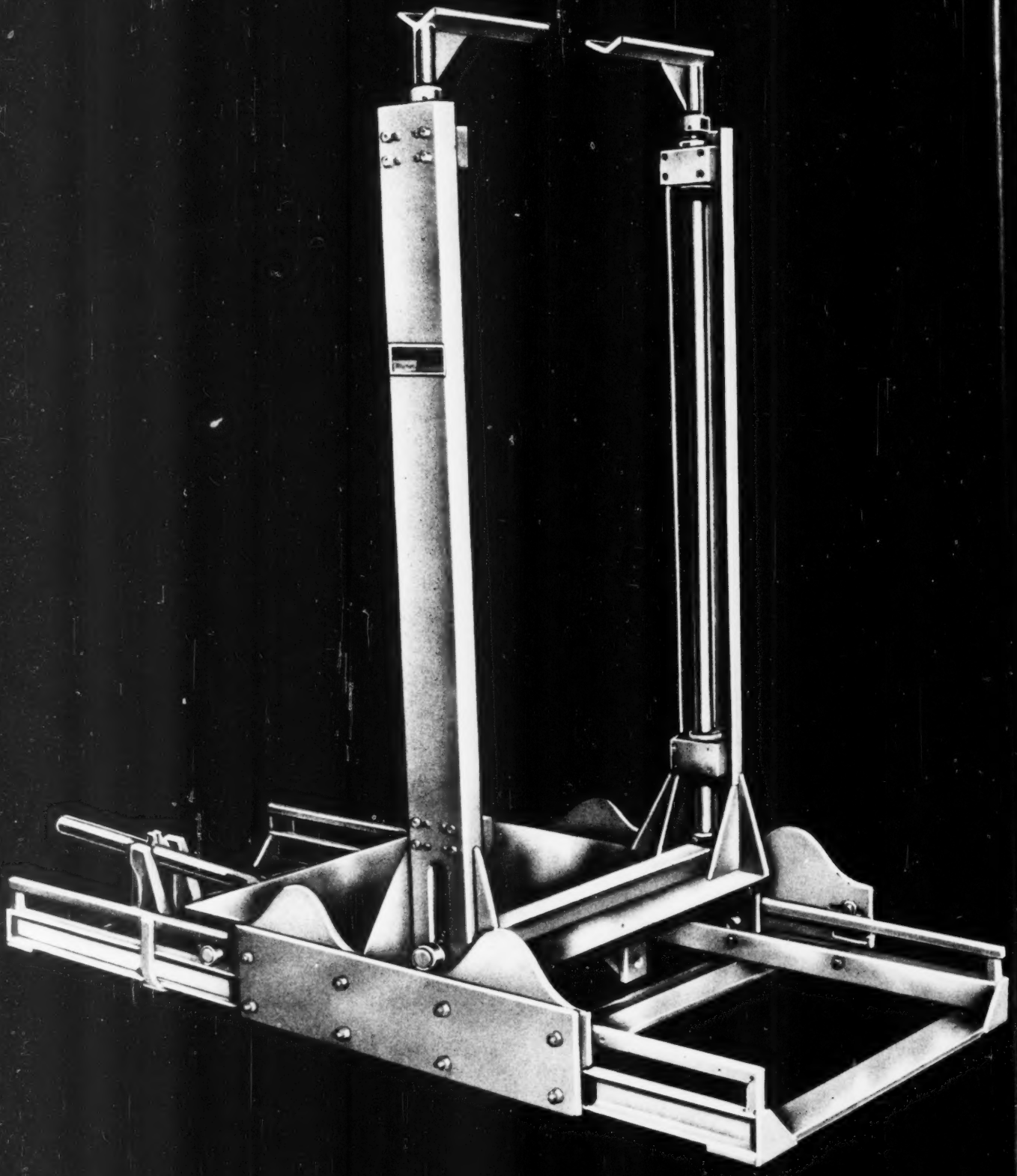




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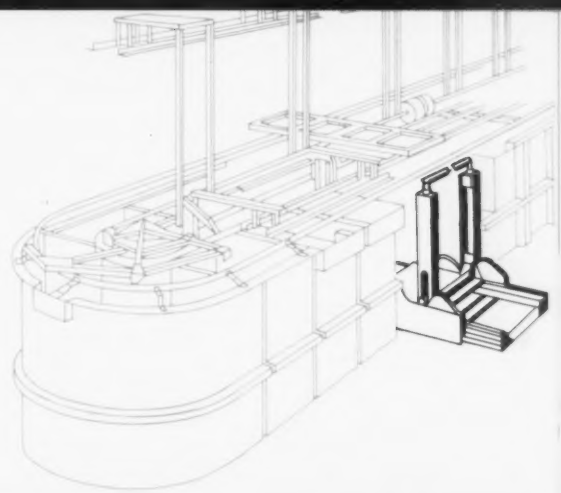
WAGNER BROTHERS





EW AUTO-LOADER*

oes a man's job . . .
heaper, faster, better!



Still manually loading your automatic? Workers complaining about lifting heavy loads? Looking for a way to decrease labor costs, to add several thousand dollars to your net profits? Well, Wagner Brothers' new Auto-Loader can solve your problems!

Because it eliminates expensive manual loading operations, the Auto-Loader costs you nothing—it pays for itself.

It makes no difference what make or type of automatic processing equipment you now have; the Auto-Loader is *easily adapted to any automatic using an intermittent motion,* double or single lane. If desired, Wagner Brothers will engineer it into your present system at a nominal service charge.

Unlike some automatic loaders, the Auto-Loader will accommodate a monorail conveyor operating on different planes—you needn't rebuild your conveyor.

Its rugged construction, absolutely simple design virtually eliminate maintenance headaches, even under continuous heavy service.

All transfer mechanism is mounted on a reciprocating platform, moving on rollers in a channel track. Cam followers attached to the lifting arms duplicate the eccentric contour of the side plates to raise and lower the lifting arms into the loading and unloading positions. The cycle of the Auto-Loader is controlled by the limit switches of the automatic, actuated by a hydraulic cylinder (or an electric drive) to move in perfectly-timed unison with the transfer cycle of the automatic.

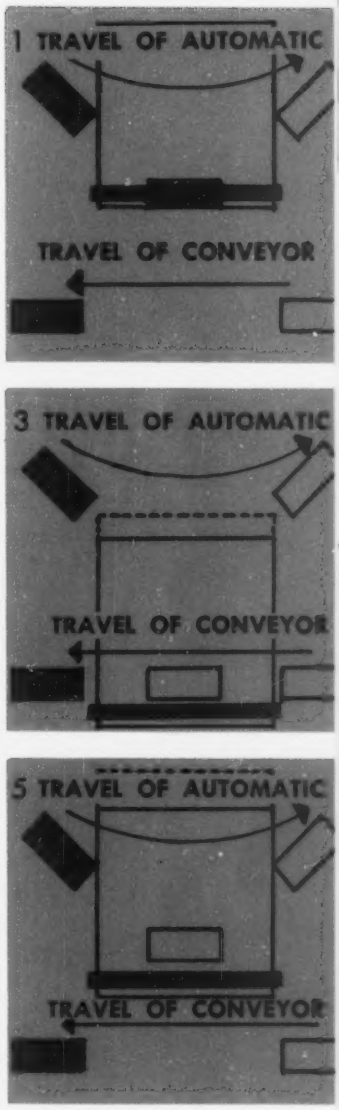
**Patents Pending*

The Auto-Loader can be used for any automatic parts processing operation such as electroplating, anodizing, phosphate coating, etching, electropolishing, oxide coating, painting, cleaning, etc.

WRITE NOW FOR PRODUCT INFORMATION AND QUOTATION

OPERATING CYCLE —LOAD & UNLOAD

1—Processed rack being unloaded from machine.
2—Processed rack loaded on conveyor.
3—Conveyor indexing.
4—Unprocessed rack loaded on machine.
5—Machine indexing.

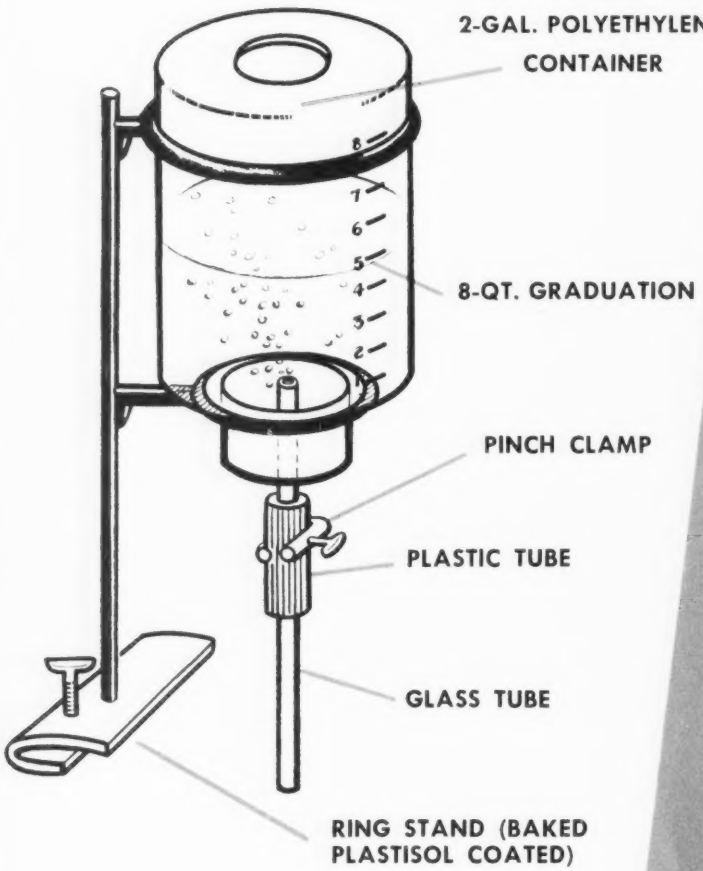


PROCESSED RACK UNPROCESSED RAC

WAGNER
BROTHERS, INC.
490 MIDLAND • DETROIT 3, MICH.

a sure and easy way

to dispense with chromic acid mist



KROME-ON DISPENSER

You can now control chromic acid misting more accurately, easier than ever before by using Krome-On* mist-inhibiting additive in this new dispenser. A graduated scale on the 2-gal. polyethylene container indicates the quantity to add; you make additions effortlessly by opening a pinch clamp, letting the solution flow into the tank.

Many chrome platers have already discovered the remarkable mist-inhibiting qualities of Krome-On addition agent. You, too, will find that Krome-On costs you nothing to use; it pays for itself in decreased chromic acid spray, drag-out and flue losses. It simplifies waste disposal, assures a safe, clean atmosphere at reduced ventilating cost.

And Krome-On also gives you, at no extra cost, advantages no other mist inhibitor can offer. Krome-On actually improves the efficiency of your chrome plating operation since you can get the same amount of throw at reduced amperage. You plate at lower current densities, thereby reduce "burning" and subsequent color buffing costs.

Since Krome-On is soluble, it will not cake-up your tanks. It does not alter the sulfate radical of the chrome bath, thus will not change the chosen ratio.

Let our service representative demonstrate the obvious advantages of Krome-On in the new dispenser. *Call or write now!*

*Patents Pending

WAGNER BROTHERS, INC.

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PHONE TULSA 3-0100

☐ Please forward additional information on Krome-On and Dispenser.

☐ Have representative call.

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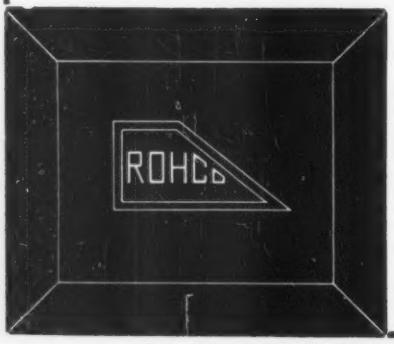
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Will Pay You EXTRA Dividends!



WITH

ROHCO NO-CRO-MIST®

NO-CRO-MIST is unequalled in economical mist-control of Chrome Plating Baths.

Here's what IMPROVED NO-CRO-MIST gives you in EXTRA dividends:

1. Eliminates up to 95% of normal chrome spray.

2. Case histories report markedly improved covering power — as much as 20% lower total current can be used.

3. Contains nothing that will harm the plating bath.

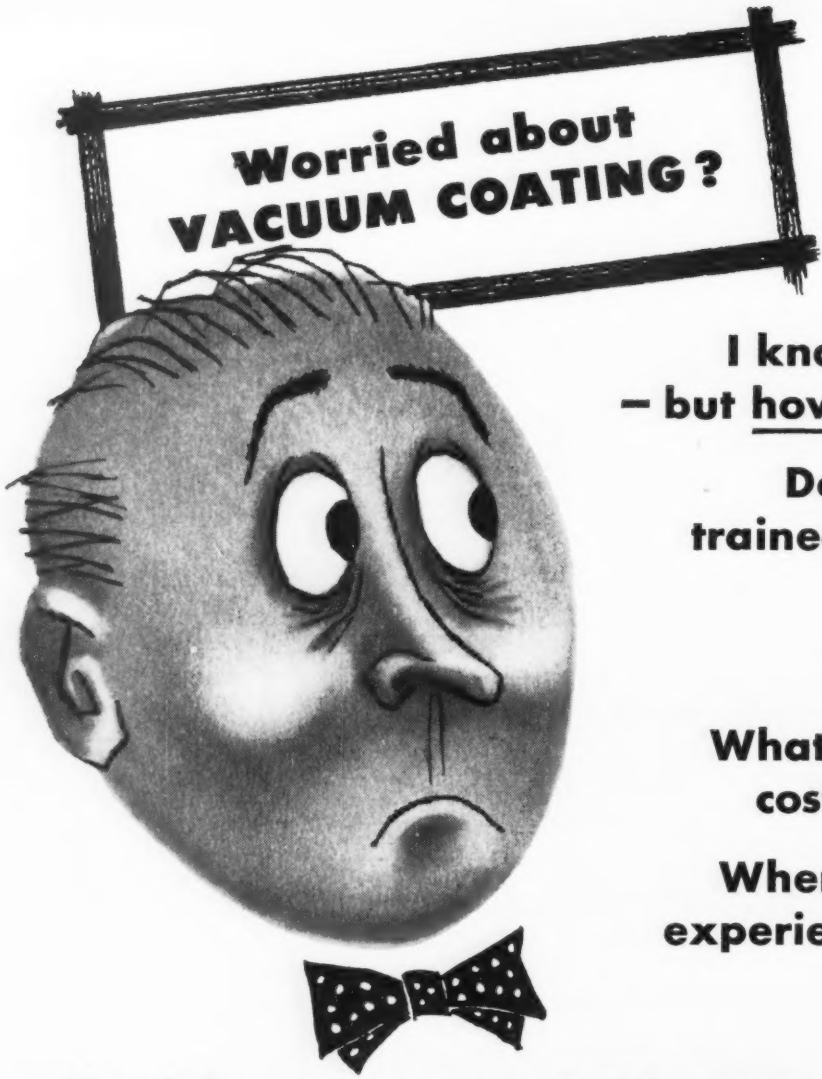
4. Greatly decreases dragout losses; helps solve rinsing and waste disposal problems.

5. Lowest in cost by far than any low-foam surface active agent. Pays for itself in savings!

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Do I need trained operators?

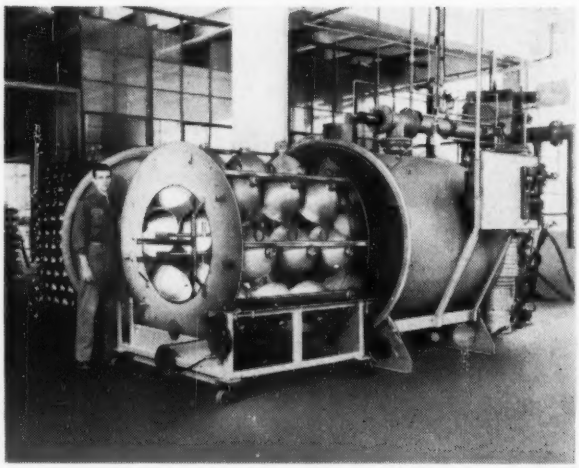
What's the story on lacquers?

What will my costs be?

Where do I get experienced advice?

Here's how to get started with low-cost vacuum coating . . .

It is really quite simple. National Research technicians have a great store of vacuum coating experience available for your use. They are experience-equipped to design a *complete vacuum coating system* for you. Give you an idea of your costs ahead of time. Supply you with a vacuum-coated sample of your product. Make the installation. Advise on lacquers. Train operators. Stand by to help you quickly get into profitable production. Here's the easy, sure way to use the latest, low-cost method of coating metals and plastics with beautiful metallic coatings. Send coupon.



Reflector finishing costs dropped 75% when this National Research vacuum coater replaced electroplating.

Other NRC high vacuum products include: analyzers, dehydrators, freeze driers, impregnators, gauges, metallizers, pumps, valves.

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Please send me the "Rapid Cycle" Vacuum Coater Bulletin.

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Company_____

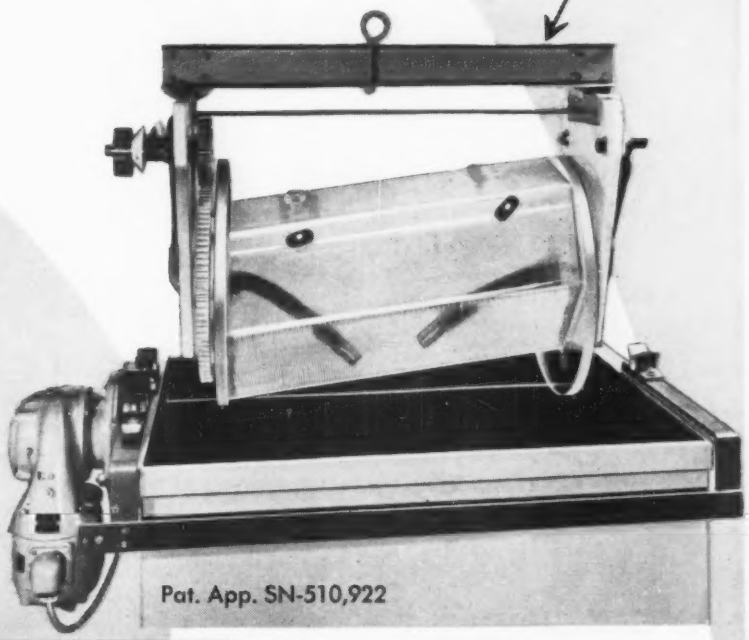
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Improves Plating Quality
Reduces Plating Time
Cuts Plating Cost

Eccentrically mounted cylinder oscillates as it rotates



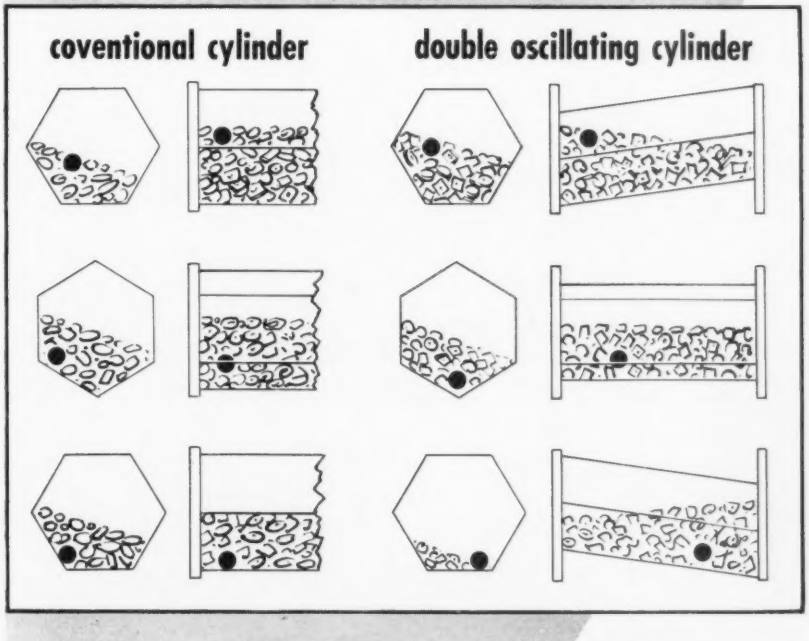
Pat. App. SN-510,922

Why!

Because the parts move up and down, back and forth, round and round. All faces are exposed. You get a specified thickness on all surfaces in less time.

See the difference

The diagrams below illustrate the difference in mixing action. The black spot represents a marked piece in the work.
Note how the black spot moves round and round in the conventional cylinder.
Then note how the black spot moves both around and across in the Double Oscillating Cylinder.



Mixes work the way a plating cylinder should

When you see this new multiple mixing action you'll agree it's the way a plating barrel should work and want no other kind.

Fortunately, all the new multiple mixing action comes from the cylinder. You can get wonderful improvement using the new cylinders with present equipment, but complete barrels designed throughout for double oscillation give even greater benefits.

See your BELKE Service Engineer or send for literature.

BELKE Double Oscillating Cylinders are available in all sizes from 14x30 regulars to 6x12 portables.
Order a double oscillating cylinder for your hard to plate jobs. See the great improvement in plating quality and big saving in plating time.

Belke Manufacturing Company
947 N. Cicero Ave., Chicago 51

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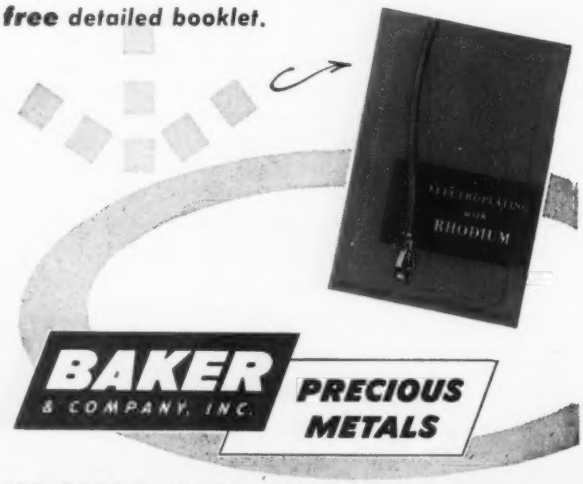
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The hard, brilliant white finish of Rhodium plate strongly resists corrosion, making it ideal for electrical and electronic applications. This exceptional property assures protection against atmospheric conditions, providing an excellent finish for ultra-high frequency applications. Its hardness and chemical resistance are unmatched for use with reflectors, particularly with the open arc.

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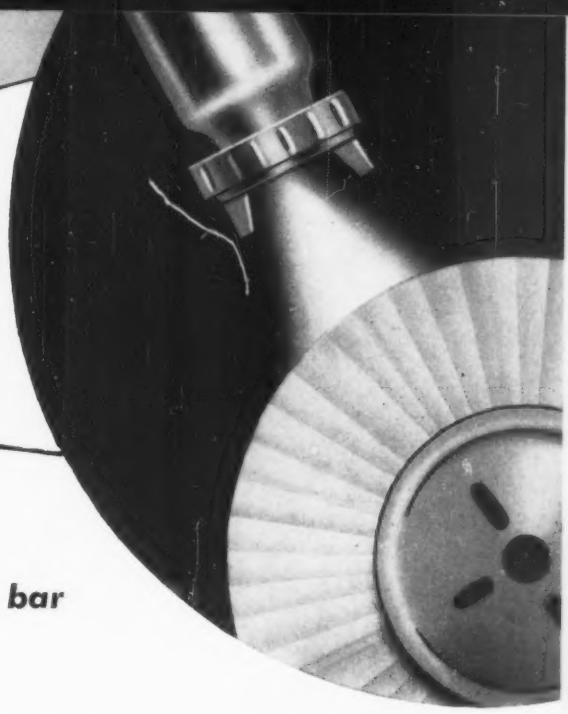
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Here's what "LIQUISPRAY" can mean to you

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- Compound costs cut up to 50%
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Here's why you should use "LIQUISPRAY"

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Choice of heavy cut, cut and color, or color in either tripoli or stainless steel grades.

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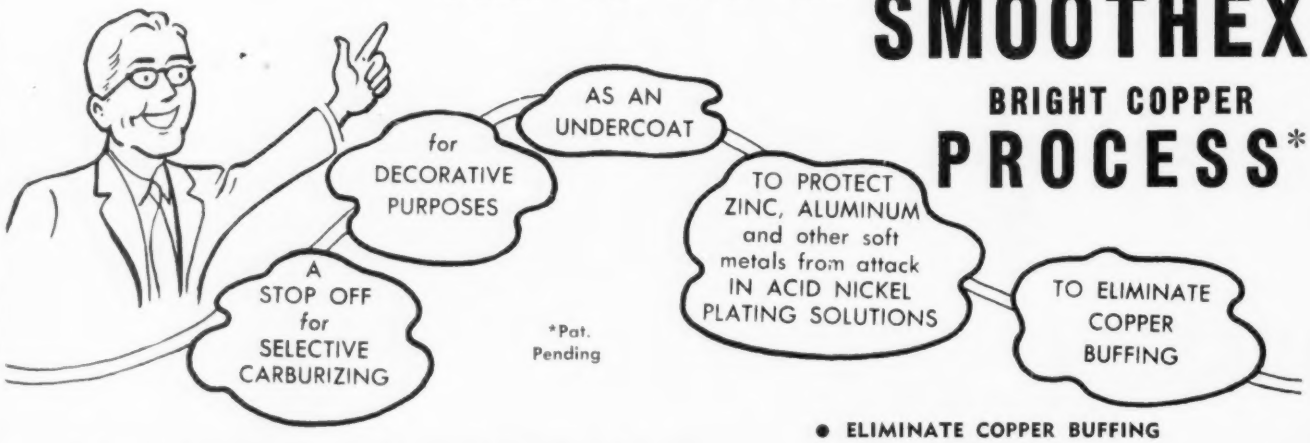
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when You USE The

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BRIGHT COPPER

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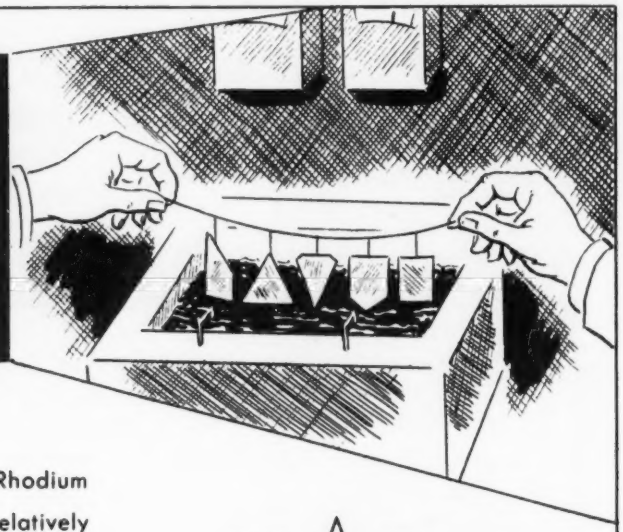
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Samuel H. Davis, general foreman, checks finish on bumpers.

Rheem Automotive Company cuts production costs with Wyandotte B.N.

The Rheem Automotive Company, of Vernon, California, is a leading manufacturer of automotive springs and bumpers. Its new plant, now under construction at Fullerton, California, will house the largest plating installation on the West Coast.

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Wyandotte B.N. is a versatile cleaner that does many jobs well. Rheem Automotive Company uses it as a soak cleaner, and as both an anodic and cathodic electrocleaner. They report excellent cleaning results. Wyandotte B.N. helps them keep cleaning costs low, too, because it has an exceptionally long cleaning life. And, with Wyandotte B.N., rejects are cut to a minimum!

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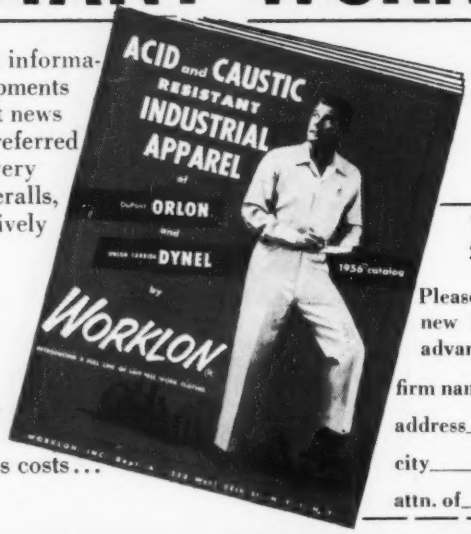
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Photo courtesy Kaybar, Inc., Hazel Park, Michigan

what's going on here?

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EVERY USER *knows* that in coatings for racks and screens, there's never any question of quality with Unichrome Coating 218X. This vinyl plastisol endures all plating and cleaning cycles, does not contaminate sensitive baths, survives long hard use without damage. Users know too, that through its extended service life and reduced maintenance, they're getting lowest costs.

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UNICHROME

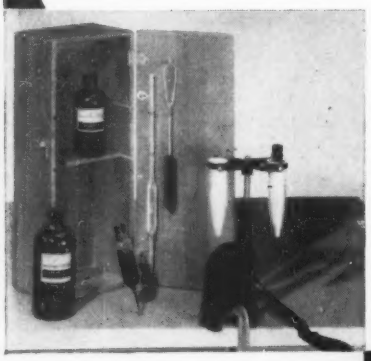
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INCREASE YOUR PRODUCTION WITH KOCOUR PLATING TEST EQUIPMENT

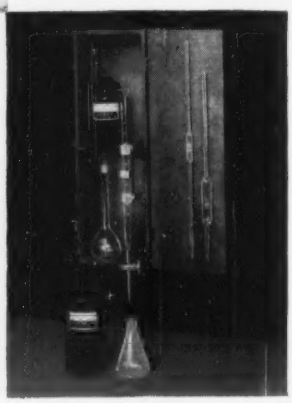


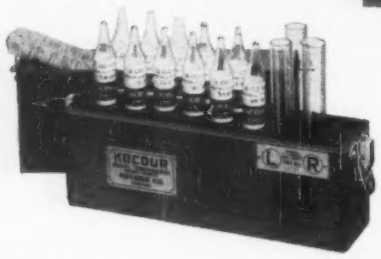
All successful platers know that using KOCOUR plating test equipment means better plating, more production, lower costs, increased profits.

● The KOCOUR Sulfate Test Set enables anyone to accurately and quickly determine the sulfate content of a chromium plating bath in order to maintain a constant check on the ratio of sulfates to chromic acid. . . . This is important to insure consistently good plating results. . . . The entire test takes about 7 minutes . . . no calculations are necessary.

● The KOCOUR Chromic Acid Test Set was designed to accurately and simply determine the chromic acid content of chromium solutions. While a hydrometer is sometimes used for this determination, if close control is desired, the solution should be analyzed.

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● Many platers use the KOCOUR Set "CR" for determining trivalent chromium in chromium solutions. The importance of this set is that a chromium solution high or low in trivalent chromium is not only expensive to operate but also is the cause of much spoiled work. The set is simple to operate . . . cost of upkeep small . . . no calculations are necessary.

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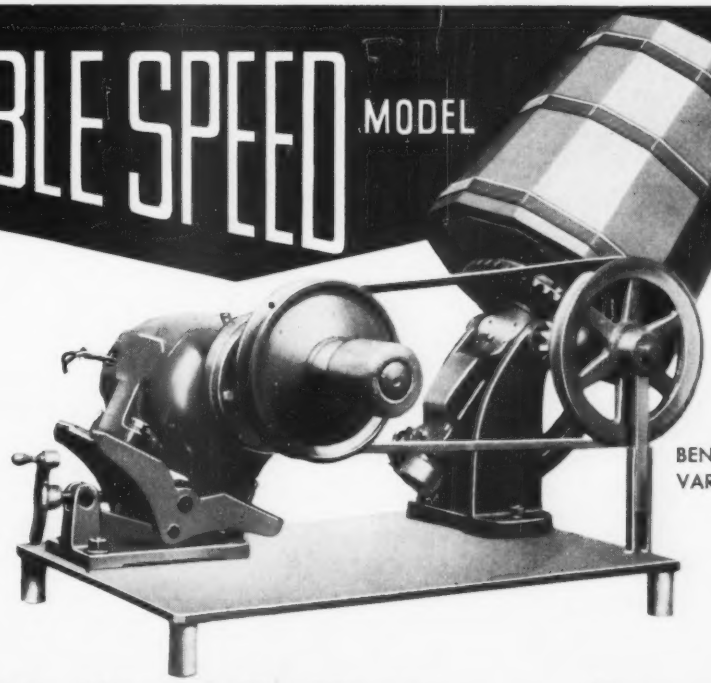
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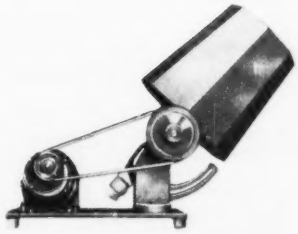
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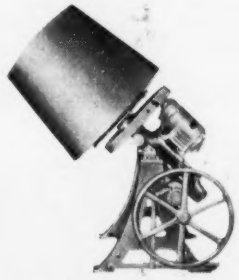
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No. 5A—Single Speed



No. 6—Single Speed

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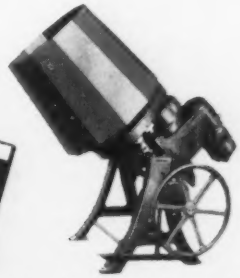
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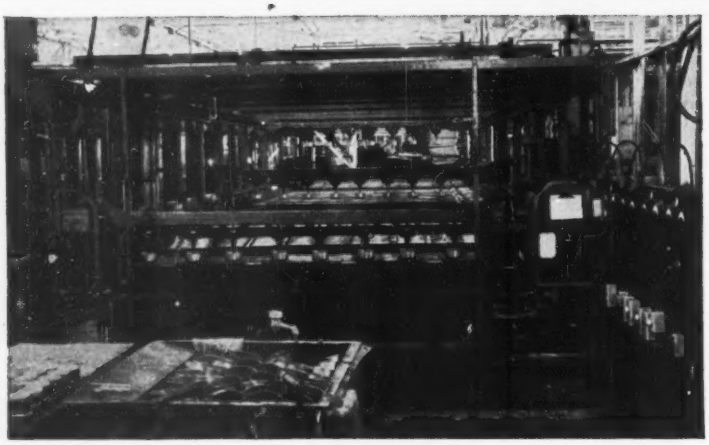
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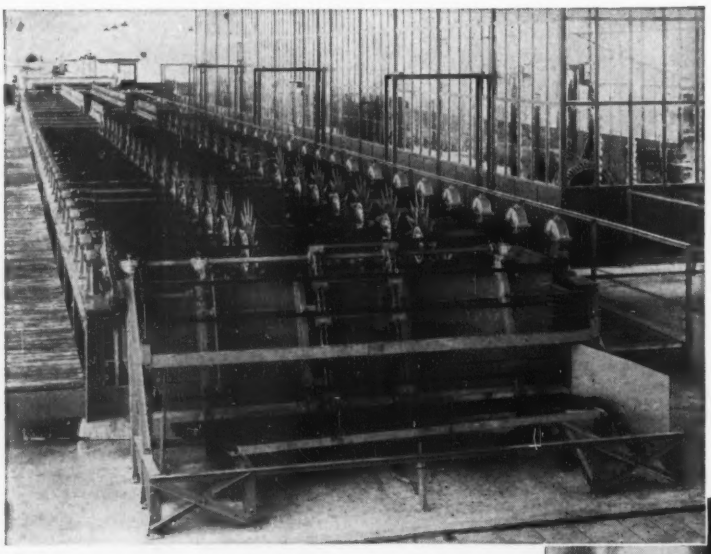
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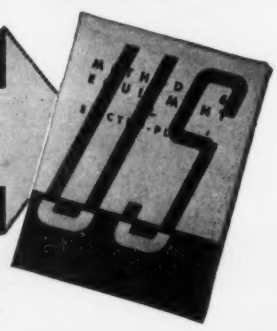


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FEBRUARY, 1956 Volume 54 Number 2

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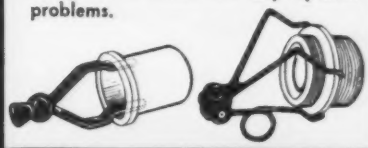
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Electrofabrication

The use of electrodeposition techniques for the *production* of objects rather than for coating other objects is as old as electroplating itself. In 1838, when Elkington patented his method of applying a metallic coating by means of an electric current, Jordan found that he could copy engravings in relief and produce matrices or molds for casting purposes. Although Prof. Jacobi is generally credited with this discovery, there is no doubt but that Jordan was first to publish a description of a definite process.

Galvanic Engraving was the term first employed, because the galvanic effect of a zinc-copper couple in copper sulfate solutions provided the required current; in other words, an internal battery. External batteries were the next step, and the term *Galvanoplasty* became popular, lasting almost until the development of dynamos, at which time *Electroforming* slowly began to take over, at the beginning of the present century. This editor, in the course of a talk given about 1936, suggested the term *Electrofabrication* as being more descriptive of the broadening scope of the process, although such an obvious term was probably employed earlier.

The process of electrofabrication is so intriguing and the possibilities so promising, it is no wonder that both laymen and scientists, for over a century, have never ceased to explore its ramifications. A large number of applications have established themselves commercially, electrotyping and production of phonograph record stampers and molds being only a few of the most familiar ones. Because of the wide interest in the subject, evidenced by the very numerous inquiries received each year, we arranged for a prominent authority to prepare a survey of the field, the first part of which appears in this issue.

Naturally, it is impossible to describe in complete detail every application, because of their number and also, as the author points out, because almost every production cycle requires appropriate modification. However, by indicating the scope of the process, the variables such as melting point, tensile strength, and hardness, which can be utilized to suit a special purpose, and the basic procedures in some standard applications, this survey will assist the reader in making an intelligent decision as to the direction of his future endeavors.

The author remarks that parts can be made "as large as an elephant." Lest this be laughed off as just a figure of speech, we might mention, in passing, that *a hundred years ago* the French firm of Christofle was producing electroformed statues, requiring as much as ten weeks plating time, almost thirty feet in height and weighing nearly 3½ tons!

Nathaniel Hall

Some Tips on Electroforming

By Marv Rubinstein, *Metal Finishing Consultant, New York, N. Y.*

Definition

ELECTROFORMING is a difficult term to define. Usually, electroformed deposits are used for industrial and engineering purposes rather than for decoration or corrosion resistance. Usually, electroformed deposits are 0.005 inch or more in thickness. Usually, electroformed deposits are later separated from the mold or matrix on which they were originally plated. Unfortunately, though all of these conditions are 'usually' met, there are many exceptions which would still be termed electroforming.

Perhaps the answer to this dilemma lies in the use of another name, and the term "Electrofabrication" has been suggested. Thus, electrofabrication (electroforming) is a method for fabricating an item by means of electrodeposition. The only essential, using this definition, is that the plating be the significant or important portion of the finished item. Approached from another angle, the engineer or metallurgist can describe electrofabrication as a "method of cold casting."

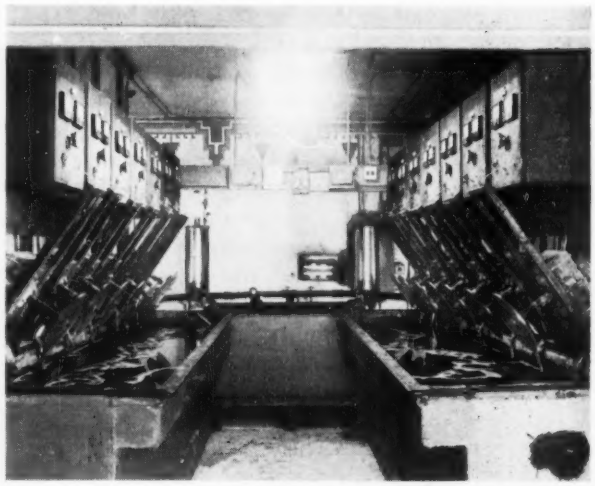
Whatever the definition, the uses of electrofabrication have grown by leaps and bounds during the last 15 years. Where once electrotyping and phonograph record manufacturing were the only commonly used applications, the following list of present day uses for electrofabrication gives an excellent idea of the extent of this growth. For convenience's sake, the list is subdivided into what the author considers to be the major divisions of electrofabricating practice:

Manufacture of Duplicating Plates: phonograph record matrices, plastic and leather embossing plates, graining plates, photo-galvanographic plates, electrotypes, stereotypes, fabric printing rolls.

Manufacture of molds and dies: hard rubber molds, copper slush molds, nickel injection molds, paint spray masks, artificial teeth molds, crown inlay molds.

Electrosizing: Repairing and/or refinishing of worn or mismachined shafts, bearings, gauges, and other parts; manufacture of aircraft bearings.

Electro-assembly: joining of pitot static tube parts; growth of small components to assembled parts (where other means are objectionable); adhesion of abrasive particles, e.g. diamond dust or silicon carbide, to cutting tools or slip-free surfaces.



(Courtesy Audio Matrix, Inc., N. Y.)

Fig. 1. A high-speed installation for electrofabricating phonograph record matrices. Utilizing cathode rotation, solution circulation and continuous filtration, this plant is capable of plating 0.005" to 0.007" of copper per hour.

Electrocladding: manufacture of nickel-clad steel sheets; fabrication of gold filled jewelry and novelties; manufacture of clad rollers for printing, plastic extrusion, and photographic film; heavy metal deposits on wood and plastic to increase mechanical strength and other properties.

Manufacture of thin walled sections: seamless tubing, foil, sheet, hypodermic needles, and fine screens and mesh.

Printed circuit fabrication.

Manufacture of parts and components difficult to make by other means: radar wave guides, reflectors, venturi meters, roughness gauges, computing cams, fountain pen caps, clock and radio dials, machine parts, jet motor bodies, spark plug coils, musical instrument horns, copper floats, burial caskets, duplicates of rare religious articles, aircraft parts, etc.

A vertical division can also be made between (1) those deposits which are later stripped or separated from the base form or mandrel (molds, pitot tubes, mesh and pen caps) and (2) those deposits which remain adhering to the original article electroclad items, diamond tools, printed circuits).

Advantages and Disadvantages

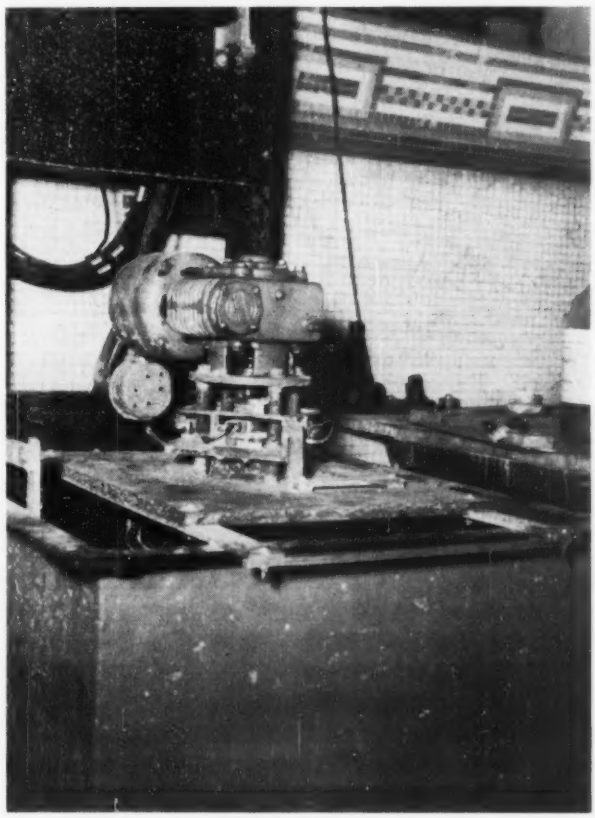
Obviously, there must be some reason for the steady growth in the use of electrofabrication. Partially, this reason rises from the fact that modern industry and technology each year makes greater demands for quality, precision and special techniques. However, it follows as a natural corollary that electrofabrication has been able to meet many of these demands, to some extent because of its inherent qualities, but to a far greater degree to the fine engineering development that has been going on in the electroplating field.

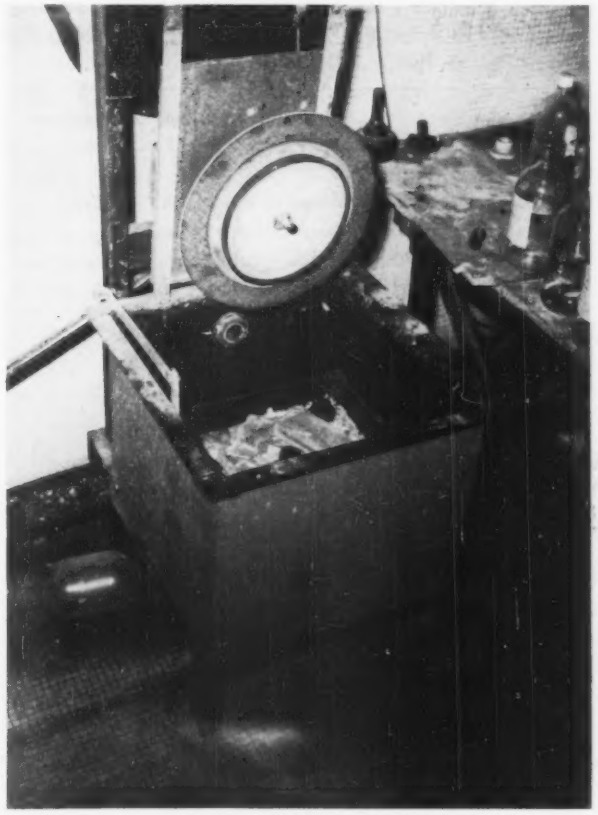
Following is a list of some tremendous advantages that electrofabrication has to offer as a means of production:

1. Excellent, easily controlled metallurgical properties. Electrodeposited metals have a wider range of hardness and tensile strength than those formed by other means. Nickel, for example, can be deposited with any desired hardness ranging from 100 to 600 Vickers.
2. Extremely close tolerances. Electrofabricated parts can be made with a tolerance of as little as $\pm$ 0.0001 inch.
3. High surface finish. Surface finishes as bright as 2 micro inches are obtainable even on the inside surfaces of electrofabricated parts.
4. No limitation on size. Electrofabricated parts can be made as large as an elephant (if the tank is big enough) and as fine as a hair. Foils less than 0.0001 inch thick are possible as is 400 mesh screen, so fine that it appears to be solid, unless held up to the light.
5. No limitation on shape. Items having two or three bends can be made in one piece — an impossible operation by any other means.
6. Precise duplication of contours. The finest detail, even an engraver's mark 0.00002 inch wide, can be accurately reproduced.
7. No minimum or maximum production runs. Electrofabrication can be run on a semi-automatic basis (as has been done with fountain pen caps) or on a single piece, without extensive tooling and jigging.

On the other hand, electrofabrication has a number of disadvantages which should be taken into consideration in choosing a production method. Production times are long compared to other methods, often as long as two or three weeks for a group of parts. Because of the precise duplication of all contours and marks, the tiniest scratches and imperfections are faithfully reproduced along with the desired detail. Designing and setting up each job requires a great deal of individual attention from a highly skilled, well paid technician — and almost all electrofabrication jobs are custom built. Sharp corners and indentation deeper than they are wide are extremely tough to plate into. Finally, and most important, where other methods can be successfully employed on a mass production basis, electrofabrication is a relatively expensive method of production.

A little thought given to the preceeding paragraphs will lead the engineer to conclude that this "cold casting" method will find its greatest application on parts of the following types: (1) Parts having complicated





(Courtesy Audio Matrix, Inc., N. Y.)

Fig. 2. A small electrofabricating tank, utilizing high-speed cathode rotation. The figure at left shows the tank in operation. The figure at right shows the rotating head raised for attachment or removal of work. Here, the work is a phonograph record matrix, but any small, regular part can be electrofabricated in this unit. Note how anodes are held in a tray directly below the cathode.

shapes which would be impossible or extremely difficult to make by any other method, e.g. radar wave guides; (2) parts having intricate designs which would require expensive engraving operations if made by other means, e.g. an injection mold for a plastic cameo; (3) parts requiring a very high polish or accurate tolerances on inside dimensions, e.g. venturi meters; (4) items requiring exact duplication of an irregular-pattern, e.g. phonograph record matrices; (5) thin walled sections, easily separated from a matrix, e.g. metal foil; (6) build-up on worn parts or parts difficult to clad otherwise, e.g. nickel clad wooden propellors; (7) assemblies where other methods of adhesion or joining are unsatisfactory, e.g. diamond tools; and (8) short production run items where other methods would require elaborate and expensive tooling.

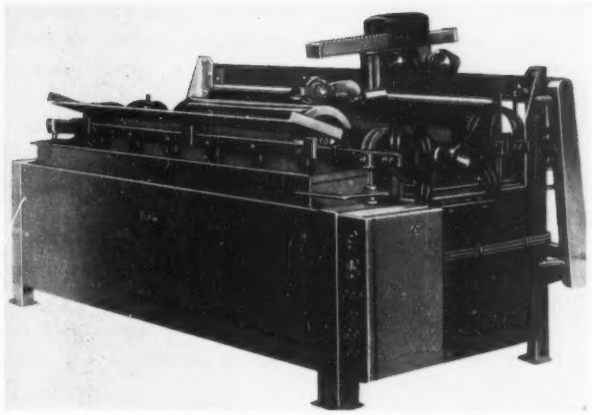
Metals and Solutions

The bulk of all electrofabrication is done in copper, nickel, iron, silver (on bearings) and chromium (build-up only). Occasional operations have also been carried out using gold, lead, zinc, antimony, cobalt and recently even alloys as black nickel, nickel-phosphorus, cobalt-phosphorus and cobalt-tungsten, where special properties are required. The question of which metal to use depends upon a number of factors, the most important of which are physical properties (hardness, tensile strength, ductility), speed of deposition, cost, and ease of application. Corrosion resistance, impact resistance, static friction, and the corrosiveness and leveling qualities of the solution required are sometimes also taken into consideration. It is interesting to note that, with a proper choice of metal, a Vickers hardness from 4 to 1000 and a ductility from 0 to 50% elongation in 2 inches can be obtained. Additional figures are given in the following table:

It can be seen that an amazing range of properties is available to the electrofabricator, not only in using different metals but also in plating the same metal from different baths and under different conditions. Further variations can be achieved by heat treatments or surface conditioning. Nickel, iron, and chromium, for example, can all be annealed to achieve appreciable increases in ductility with, of course, some loss in hardness. Electroless nickel, which deposits at a hardness of 500 Vickers, can have its hardness increased to 780 by a mild heat treatment at less than 400°F. Fabricated iron parts can undergo normal surface hardening treatments such as nitriding or case hardening. And, many of these metals can be made harder by depositing a thin film of chromium at the surface. Other properties such as tensile strength can be varied by the use of laminated deposits in the electrofabrication operation. This is sometimes also used as an economy measure, since the use of iron as a sandwiched layer results in considerable savings in metal costs.

The table also shows the effect of certain variables on deposits from a given bath. Numerous addition agents, e.g. phenolsulfonic acid in an acid copper bath, cause an appreciable increase in the hardness (and sometimes the smoothness) of the deposits. These must be chosen with care, however, to see that they are easily controlled and that they do not bring with them detrimental effects as well. The use of periodic reverse plating in any of the cyanide baths gives fruitful results in increasing hardness, toughness, and grain refinement. Alloying elements, such as cobalt in a nickel bath, increase hardness as well. Cobalt also has the interesting secondard property of very much increasing the electrical resistivity of the deposit for applications where such a property is desired.

Metal	*Plating Solution Used*	*Hardness (Vickers)*	*Elongation (% in 2 in.)*	*Tensile Strength (P.S.I. × 10^3)*
Copper	Acid Sulfate	40-85	15-40	33-68
	Acid Sulfate + Additions	80-180	1-20	69-90
	Fluoborate	40-75	6-20	17-40
	High Speed Cyanide	100-160	30-50	------
	High Speed Cyanide + P.R.	150-220	6-9	100-110
Nickel	Watts	100-250	10-35	50-80
	Chloride	230-300	10-21	90-125
	Hard Nickel	350-500	4-10	140-160
	Fluoborate	125-300	5-32	55-120
	Fluoborate + Additions	400-600	1-4	20-200
	Sulfamate	200-550	6-30	60-130
	Sulfamate-Chloride	200-625	3-5	94-155
	Nickel-Cobalt	300-600	------	------
	Electroless	500-780	0-3	------
Iron	Sulfate	180-400	0-3	110-120
	Chloride	125-220	10-50	47-113
	Fluoborate	------	------	------
Chromium	Standard	300-1000	0-0.1	10-30
	High Speed			
Silver	High Speed Cyanide	55-130	10-20	35-50
Gold	Industrial Bath	20-65	------	------
	Bright (proprietary)	110-120	------	------
Lead	Fluoborate	4-10	------	------



(Courtesy Langbein Pfanhauser Works, Germany)

Fig. 3. An installation for the high-speed copper electrofabrication of Intaglio Cylinders, often used in printing designs on cloth. This is a German unit, but similar equipment is manufactured in the United States.

Experience in electrofabrication will indicate other manipulative techniques of value in controlling the properties of the plate. Lower temperatures, higher current densities and higher pH's will, generally speaking, result in harder deposits. (Note: pH effects are somewhat more irregular in iron plating.) In general, the harder the deposit the greater the tensile strength and the lower the ductility.

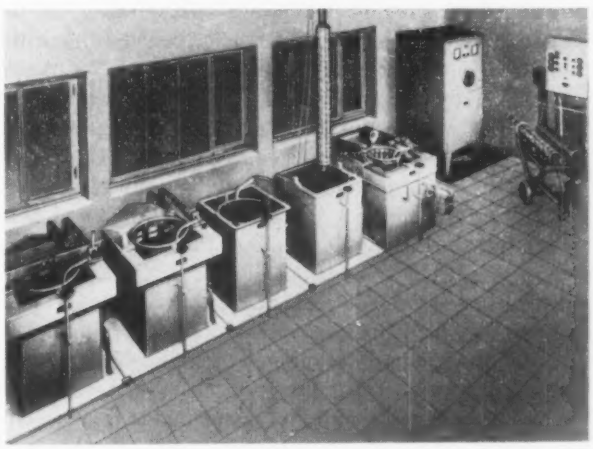
Stress in Electrodeposition

The subject of stress in electrodeposited coatings assumes so great an importance in electrofabrication that it deserves individual discussion. Most metals are stressed in the as-plated state, some more some less, depending on intrinsic qualities and on the conditions of plating. Chromium, cobalt and nickel normally have a high tensile stress. Iron deposits have a moderate tensile stress, while copper and silver have only a slight tensile stress. Lead, on the other hand, normally gives compressively stressed deposits. (Tensile stresses can often be observed in separation of the plate from the base metal around the edges. With compressive stresses, the separation occurs near the center of the deposit.)

In decorative plating, deposits are so thin that stresses do not usually reach the magnitude where they cause difficulties. In plating thick deposits, however, stresses — particularly tensile stresses — are apt to cause peeling, blistering, distortion and other evidence of failure. Furthermore, high tensile stresses not only cause failure in plated coatings but also cause premature fatigue failure in base metals, since a large percentage of fatigue failures originate at the surface. It can easily be seen that the electrofabricator will have particular difficulty with highly stressed deposits. If plated on non-metallic mandrels or on weakly adherent parting media, highly stressed deposits will tend to curl up and separate from the base. Even if this is avoided, when the plated part is separated from the mandrel it will very often distort slightly. This is particularly true of large pieces or of injection molds which undergo heat and pressure. Even if the plate is not separated from the base later, as in electrocladding or electrosizing of worn parts, stresses may cause trouble by inducing early fatigue failure in the part. In an aircraft engine part, for example, this can lead to extremely serious results.

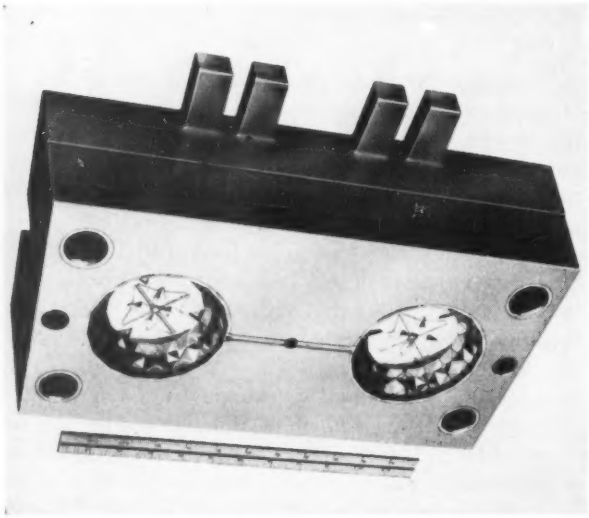
Thus, the plater doing electrofabrication must be familiar with the causes of stress, the means of measuring stress, and how to control it. Until recently, the only available method for measuring stress was the relatively slow and tedious one of measuring the curvature of a metal strip that had been stopped-off on one side and then plated to a given thickness. This method has been superseded by two instruments which are much simpler to set up and which give direct dial readings easily converted to accurate stress figures. The first of these is the Brenner-Senderoff spiral contractometer, based on the change in diameter of a stainless steel spiral when metal is deposited on the outer surface. The second is the Kushner stresometer, an instrument which measures the flexure of a circular stainless steel or copper disc due to deposition on one surface. The contractometer transmits its variations mechanically to a calibrated dial, while the stresometer has a hydraulic magnification factor shown on a straight scale. The results with both instruments are reproducable.

With the means for measuring stress available, the next step is to know the variables which create or reduce stress. Unfortunately, there is no standard set of rules for all solutions, but a few generalizations can be made for baths which produce tensile stress. 1. Generally speaking, the metal content or buffer content has little or no effect on stress. 2. An increase in temperature of the bath usually causes a decrease in stress; note, however, that the reverse is true for deposits of chromium over 0.0003 inch thick, due to a stress relieving mechanism involving minute cracks in the deposit. 3. Stress generally increases with an increase in current density, again with the partial exception of chromium. 4. Many wetting agents tend to decrease stress slightly. 5. Most organics cause an appreciable increase in tensile stress. 6. A few organics, e.g. saccharin (0.2-1.0 g./l.) and p-toluene sulfonamide cause a sharp reduction in tensile stress and can cause compressive stress. 7. The presence of certain specific salts in specific baths may radically effect the stress. A typical example is the presence of



(Courtesy Langhein Pfanhauser Works, Germany)

Fig. 4. A set of tanks for vertical chromium plating of the Intaglio Cylinders previously shown. Of course, any regular cylindrical or long, rectangular shape can be heavy chrome plated in such an installation.



(Courtesy London & Scandinavian, Ltd., England)

Fig. 5. An electrofabricated die for injection molding. The mold cavity is electrofabricated from nickel, backed up with copper, and then machined to a regular shape. This is then set into a steel bolster, as shown in the photograph.

chlorides in nickel baths. Chlorides cause a sharp rise in tensile stress of nickel deposits.

Choice of Bath and Metal

With the above facts in mind, the proper metal and bath for a particular job can be chosen. Copper plating has the advantage of the highest ductility. Also, if the fluoborate bath is used, it gives the highest rates of deposition; if periodic reverse — high speed cyanide is used, it gives the maximum throwing power and leveling properties. The major disadvantage of copper is its relative softness and, when hardening agents are used, the difficulty of controlling them.

The superior hardness and tensile strength of nickel accounts for its growing use in electrofabrication. Its primary disadvantage has always been its high degree of tensile stress, and this can for the most part now be avoided by using chloride free baths such as the sulfamate or the fluoborate. Alternatively, if the plater wishes to avoid the higher cost of these baths, he may use any of the chloride-containing baths and control stress by keeping out all organics except perhaps stress reducing agents like saccharin. Nickel has the added advantage of being corrosion resistant, but the unfortunate disadvantage of being an expensive metal.

It is for the most part as a less costly substitute for nickel that the use of iron plating has grown. Iron plating, in fact, is used for little else but electrofabrication. From the ferrous sulfate or ferrous ammonium sulfate baths, it offers the hardness of most nickels. From the chloride bath, it offers the ductility of copper, but with a greater tensile strength. The metallurgical properties of iron from the fluoborate bath have not yet been properly tested, but this bath avoids some of the operational difficulties found in the others and gives relatively rapid deposits. Unfortunately, both the fluoborate bath and hot chloride bath are comparatively corrosive and, more important, the final plate is easily corroded.

Heavy chromium deposits have the advantage of extreme hardness coupled with a low coefficient of friction. Their primary disadvantages are their high stress, now partially controllable, coupled with a ductility of practically zero. Furthermore, chromium baths have a low rate of deposition and the worst throwing power of all baths discussed. Because of the disadvantages, the writer suggests hard nickel with a final layer of chromium, wherever this substitution can be made, for building-up thicknesses of 0.010 inch or more.

Silver, gold, lead, and other metals used in electrofabrication are utilized only for specal purposes where their specific properties can best be put to use. Silver, for example, has high resiliency, while lead has a degree of surface 'oiliness,' which accounts for their use in aircraft bearings.

Some Standard Practices

Strictly speaking, there is no such thing as standard practice in electrofabrication, since each job is a custom operation. If there be any true standards, they can be found more in control and operational technique rather than in the precise way of setting up the job. Thus, in 95% of shops doing electrofabricating, the following will be found:

1. Constant or very frequent filtration.
2. A high degree of agitation — often solution circulation or cathode rotation.
3. Thermostatic controls.
4. The use of addition agents and wetting agents.
5. The use of precisely engineered racks, current thieves, inside anodes, etc.
6. Accurately calibrated ammeters, voltmeters, ampere-hour meters, etc.
7. Frequent chemical analyses, stress checks, adhesion tests and other tests of the quality of the deposit.

Even in setting up the job, however, there are certain general procedures more used than not. These procedures can be divided into two sets: (1) applications where the plating is later to be separated from its matrix or mandrel, and (2) applications where the plating remains attached to its base.

In the latter case, where it is desired to get the maximum adhesion possible, the parts are first prepared for plating by roughening the surface. For this a variety of methods are used, some chemical, some electrochemical, some physical. A number of these chemical methods are covered in the METAL FINISHING GUIDEBOOK in the section on "Preparation of Metals for Plating." Mechanical methods include sand blasting, vapor blasting, sand or pumice rolling, and scratch-brushing or sanding. Whatever the method, the purpose is to provide mechanical keying of the deposit in order to achieve maximum adhesion.

In the case of those parts later to be separated from the mold of mandrel on which they are plated, the surface requires exactly the opposite type of preparation. That is, it must be conductive yet not adherent but, at the same time, there must be enough adhesion so that the deposit does not lift prematurely. Before means of achieving this are discussed, it would be wiser to begin at the beginning and describe the matrix or mandrel, i.e. the original shape or pattern on which the electrofabricated part is plated.

(To Be Continued)

Production Barrel Finishing

By Albert Polucha, *Liaison Engineer, Wm. R. Whittaker Co., Los Angeles, Calif.*

Planning and Layout

THE first step, of course, in production barrel finishing, is to make an analysis of all the different types of parts which it is desired to process in a barrel in order to cut down on costs. Are they large, small, punch press blankings, machined parts, or what? The type of material to be processed is not usually a prime concern to the planner, as almost any material can be processed in the barrel. However, the finish to be applied to the parts is definitely a problem as will be discussed later in this article.

Weight is a critical factor in barrel finishing and, generally speaking, it is not recommended that parts weighing more than three pounds each be run loose in a barrel. However, this statement is dependent upon the size, shape, and amount of parts to be run in the barrel at one time. Also, parts weighing ten pounds and more are processed in barrels by attaching them to fixtures which hold the parts stable while the media is passed over them.

From the above, one can readily see that a careful analysis is necessary.

Let us assume that the analysis is complete and that all types of blanked and machined parts are to be processed. At the outset of operations these parts are to be processed loose.

The amount of square feet alloted to a barrel finishing department is, of course, dependent upon the size of the machinery installed. Usually a twenty foot width is ample. The length depends upon the number of machines to be installed.

The floor should slope ¼" per foot along the width of the area. It should terminate at a trough or gutter which starts at a 3" depth and slopes ¼" per foot towards a sump. The sump should have a four to six inch diameter overflow pipe leading to the sewer. The overflow pipe should have a removable test cover for checking the pH of the water before it empties into the sewer drains. It is recommended that there be installed one baffle to every ten feet of gutter plus a fall in the sump to deflect the sludge from the overflow. A regular schedule for emptying the sump of solid matter should be initiated immediately at the beginning of operations.

The above plans are, of course, contingent upon the rules and regulations of the local municipal waste and sanitation authorities. During the past few years, a great many new and stringent laws have been passed by various committees in regard to sewer waste emissions. It is therefore recommended that, before a sump be constructed, an authorized blueprint of same should be obtained from the department of sanitation and followed accordingly. Generally speaking, it is believed that the above floor plan will satisfy most community rules wih regard to sewer emissions.

Power, gas, air, and water lines should be installed. The gas lines should terminate at a point where a hot water rinse tank is to be installed. There are some who advocate using hot water in the barrels. In the writer's opinion this is not a necessity except in burnishing and high finishing processes. Others advise the use of demineralized or treated water. This too, we believe, unnecessary to the deburring stage providing the water is not of abnormal mineral content.

Air lines are needed for blowing out water and sometime abrasive which has, at times, a tendency to lodge in small crevices and blind tapped holes.

Equipment

The size of a barrel is dependent upon the size of the parts to be processed. Ordinarily, for small machined parts such as fittings, washers, and lock nuts, a one cubic foot capacity barrel is sufficient. These barrels are usually mounted in pairs and run off one electric motor.

The barrels should be lined with rubber, Neoprene, or similar material. There must be a speed control on all barrel equipment. In the author's opinion, a barrel without a speed control is 75% inefficient. Barrels with motors and working mechanism situated on top of the barrel are preferred, as barrel finishing at best is a wet and damp operation.

Additional equipment for the barrels should be as follows: perforated drain doors for fast drainage; cam type locking water tight doors for ease and speed in opening and closing doors; loading and unloading drawers complete with separating screens which, for convenience and production sake, are usually an integral part of the machine and; finally, for the sake of safety, a relief valve on every water tight door. Removable steel rims to fit over the barrel opening should be made or bought so that, while loading parts and media with the tote or hoist pans, wear and tear on the rims of the barrels would be absorbed by these steel guards.

This size of barrel and equipment can be handled by the average worker without the use of power hoists or mechanical lifting equipment.

For larger parts and components that are to be processed, a barrel of twelve to fifteen cubic feet (30" dia.) capacity is recommended. A two compartment type is

preferred. A magnetic brake should be standard equipment on these large barrels. Here too all the working mechanism should be on top of the barrels. Standard equipment for these barrels is as follows: cam type locking water tight doors; perforated drain doors with hose attachment; speed control drive; and safety relief valve on water tight doors.

Timing devices should be installed on all barrels. These devices will allow the barrel to be operated between working shifts, as the barrel will automatically stop at the time set on the timer. Some of these devices will also automatically turn on the current just prior to the start of the oncoming shift or at any time that it is desired. Most electrical supply houses have these timers in stock.

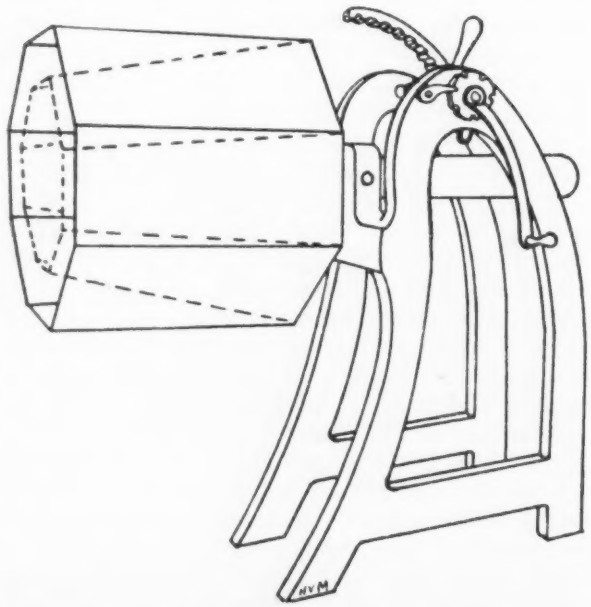
Since it would not be practical to load and unload the large barrels manually, the following items are a necessity.

For loading and unloading purposes, a self-dumping hoist pan with a removable screen at the snout and of sufficient capacity to fill the barrel with media. Steel guard rims for these large barrels are a must.

To handle the above loads a power hoist is necessary. There are several portable power hoists available on the market. However, the overhead bridge crane with power hoist attached is preferred. A hoist with a one thousand pound capacity is usually sufficient for general purposes. The traveling "I" beam of this crane should be from twelve to thirteen feet above the floor level.

In order to unload the barrels in the shortest possible time, a portable vibrating screening unit with four to five different size screens is a time saver. This inclined screen is placed under the barrel. The hoist pan is placed under the screen. After plugging in the power line to start the screen vibrating, the entire contents of the barrel are dumped onto the vibrating screen with the result that the media falls to the hoist pan below and the parts are carried to a box at the end of the vibrating screen. The operation usually takes only a few minutes.

If the parts being processed have a high finish, it is sometimes necessary to coat the screens with rubber or latex in order to avoid scratching or nicking the parts while unloading.



Oblique Barrel

The screening unit can be obtained with a removable hopper for screening chips to their various sizes. Bins for storage of the various size chips should be installed for the different sizes must be kept segregated. These bins are usually designed with hoppers on the underside for easy unloading.

Other essential items are rinse tanks, oil dip tanks, benches, a ten to twenty power microscope and a magnet for removing steel parts from the chips where it is not possible to remove the parts by screening.

One of the most important items to be purchased will be the deburring chips or media, as it is called. A few explanations are in order here. There are on the market today several types of chips or media for which their manufacturers have made all kinds of claims. Among those that the author has tried and used are: vegetable ivory chips, aluminum oxide impregnated rubber chips, soft and cast iron shot, zinc shapes, granite chips, limestone chips, beach pebbles and synthetic aluminum oxide chips.

For price, wear resistance, availability and general all around barrel efficiency, the synthetic aluminum oxide chip is the most universally used today, sold under various trade names.

The sizes of the chips are usually numbered from 00 to 12, with 00 being 2″ by 1½″ while No. 12 will pass through a #12 mesh. Some suppliers use a different sizing system but, generally speaking, the above holds good in a majority of cases.

For an initial supply #3½, #4, #4½, #5 chips are suggested. These should be purchased "pretumbled," so that breakage and conditioning of the chips will be held to a minimum prior to start of production.

Finally, compounds must be purchased. The purpose of these compounds is to assist the chips in deburring or polishing parts in the barrel by either conditioning the chips with abrasives and/or chemicals that are in the compounds, or glazing and smoothing over the surface of the chips with a lubricating film for burnishing or polishing the parts. Unless the reader has had previous barrel finishing experience, it would be wise to consult the representative or field engineer of a reliable supplier before purchasing any compounds. The author recommends three different grades of grinding or deburring compounds, two grades of burnishing compounds, and one type of cleaning compound for flushing the abrasives from the barrels.

Operating Procedure

Before beginning this section on processing, the reader must have some knowledge of the basic theory of barrel finishing. The action of the barrel is as follows: as the barrel rotates the mass of media and parts, a point is reached where gravity overcomes the centrifugal force and the tendency of the mass to stick together, so that the upper layer of the work load starts to slide. This sliding action causes the media and compound to grind against each other, thus causing the parts to be deburred.

If the r.p.m. of the barrel is increased, the centrifugal force causes the mass to stick together until it

reaches a much higher turnover point in the barrel. This will cause the mass to drop instead of slide, and increases the chance of peening the parts and causing them to hit each other. In the case of some parts, this might not cause any harm to the components but, in the majority of cases, the sliding action must be adhered to.

The following rules usually apply in barrel finishing.

1. The larger chips deburr fastest, while the smallest chips not only deburr slowest but also give the finest finish.
2. Barrels should be loaded from 50% to 70% full with media. The right amount needed will be gained from experience.
3. In grinding or deburring, the water level is usually held well below the level of the mass.
4. In polishing or burnishing, the water level is usually held well above the mass.
5. Generally speaking, the lighter the parts the faster the r.p.m. and, conversely, the heavier the slower the r.p.m. of the barrel.
6. It is better to underload than to overload the barrel with parts.
7. All parts, prior to barrel finishing, should be degreased and/or thoroughly cleaned.
8. Barrel finishing will not deburr blind holes or deadend areas. Generally speaking, the media must not only have free entry to the burr area, but also an open exit from it.

The following is a step by step explanation of a complete barrel deburring cycle:

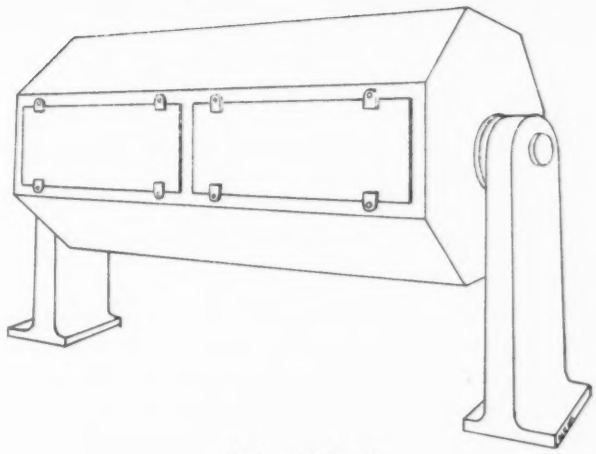
The barrel is loaded with a predetermined amount of parts, chips, compound and water. After turning on the power, the proper r.p.m. is obtained by adjusting the speed reducer. The timer is then set for the time cycle required to deburr the part.

At the conclusion of the cycle the barrel is turned, either by power or by hand on the small barrels, until the doors are at the highest point of the circumference of the barrel. The safety valve is then opened to allow any gas or heat generated in the barrel to escape. At times this valve has a tendency to plug up with chips and compounds so that care should be taken to keep it open at all times.

The watertight doors are then removed and replaced with perforated drain doors. The barrel is filled with fresh water and allowed to rotate slowly while it is draining. We recommend three rinses. During the draining process, the water can be dumped into the hoist pan which diverts it to the gutter or directly on the sloping floor depending on the design of the machine. On the large machine the hose attachment on the drain doors will be found very handy as it takes a few minutes to refill the large barrel.

After rinsing, the proper screen is placed in the hoist pan or vibrating screen unit and the load is slowly dumped on the screen. The chips then fall through the screen to the hoist pan below and the parts are removed and ready for a hot water rinse. It would be wise to remove a few sample parts from the barrel for inspection before starting the rinse and unloading operation, as the time cycle varies in accordance with the type of burrs left on the part.

If a polishing operation is necessary after the deburring cycle, the load is rinsed thoroughly, recharged with burnishing compound and the proper amount of water, and let run in the same chips and barrel for the time required for the polishing cycle.



Horizontal Barrel

There will be times when the grinding compound will tend to adhere to the parts even after three rinses with cold water. When this happens, recharge the barrel with a cleaning compound, refill with water and let the barrel rotate for about fifteen minutes. Upon completion of this cycle, flush the barrel with clean water again and the parts will come out free of the compound grit.

Before beginning the actual processing, it would be an excellent idea for the operator to have some operation or process cards printed. On these cards the following information should be listed: part number, part name, operation number, type of material, amount of parts run in barrel, size chips, amount of chips, type and amount of compound, amount of water, running time, and barrel speed or r.p.m. In this way, after a deburring or polishing cycle is established for a given part, the operation card can be filed away for future reference.

In choosing the right size chips for the parts to be run, the writer usually runs the part by hand through the chips in the bin to see which size will not wedge itself in the crevices and holes. To try to match the size holes on the print with a larger standard size chip is impractical as the chips are never uniform in size.

A final warning to the operator. All equipment and parts must be kept thoroughly clean. The barrels must be rinsed thoroughly after each operation, especially if one is changing from a deburring to a polishing cycle in the same barrel.

Processing Different Metals

ALUMINUM AND ITS ALLOYS:

The main thing to remember in barrel finishing aluminum alloys is that they are susceptible to alkalies and can be seriously deteriorated by strong alkaline compounds. It is recommended, therefore, that the compounds used with aluminum should be certified by the supplier as being safe to use with any and all aluminum alloys.

Aluminum stampings do not present much difficulty in deburring. Usually a medium type grinding com-

pound is used for the deburring process. The ST or heat treated aluminum alloys will deburr better than the SO or soft aluminum alloys. If there is any forming to be done on a part, it is recommended that the part be deburred in the blank stage as that will not only shorten the deburring cycle, but also the barrels can be loaded more heavily with the blank parts.

If the blanking die happens to be dull at one point and leaves an excessive burr at that area, it is usually wiser to deburr that point by hand or other methods. The reason for this is that, though the barrels can remove the burr, the deburring cycle will take so long that other dimensions will be adversely affected. The operator must always keep in mind that the deburring action is going on all over the part at the same time, with most of the action centering on the corners and edges of the part. The above rule applies to any type part.

Aluminum Alclad can be deburred without completely removing the Alclad coating. However, this is such a ticklish proposition that the writer does not recommend it. A safe alternative is to use hard steel burnishing shot and burnishing compound in the barrel. This cycle will not actually deburr the parts but will roll over and, in some cases, peen the burrs. Though the cycle usually takes three times as long as a normal deburring cycle, it is at times well worth the trouble. Of course, if parts are to be anodized in a future operation a straight deburring cycle is all that is necessary.

One drawback that has been found in barrel finishing is the deburring of parts with holes ¼" and smaller in diameter. It is usually not practical to deburr these parts with chips. The chips have a tendency to fold the burr into the hole and, what with the chips being too large to go through the hole, the burr remains there. An alternative is the use of soft steel shot or shapes with deburring compound. The operator will find that the use of steel shot and grinding (not burnishing) compounds will cause friction and heat to be generated in the barrel to such an extent that the safety valve should be opened every hour to avoid the splatter that will result upon opening the barrel. Also, a heavy viscous black mass will form in the barrel. This is due to the carbon deposit removed from the steel shapes. This black mass is more dirty than dangerous and can be readily removed from the parts by washing in an ordinary commercial cleaner. The foregoing also applies to machined aluminum alloy parts.

The operator who is new to the barrel finishing process will find to his surprise that, upon completion of the deburring cycle, the aluminum parts will emerge from the barrel with a slightly greyish color. This is usually known as a satin or butler finish and is a normal condition. If the operator wishes to retain the lustrous color of machined aluminum he must use a neutral compound. That is, the pH of the compound must be close to 7.0.

If, however, a dark smutty surface presents itself on the part, then the chips and the barrel are soiled or greasy. When this happens, remove all parts from the barrel, charge with trisodium phosphate or a cleaner recommended by the supplier, fill 70% full of water, let run two hours, then drain and flush thoroughly with water. The barrel should now be ready for operation.

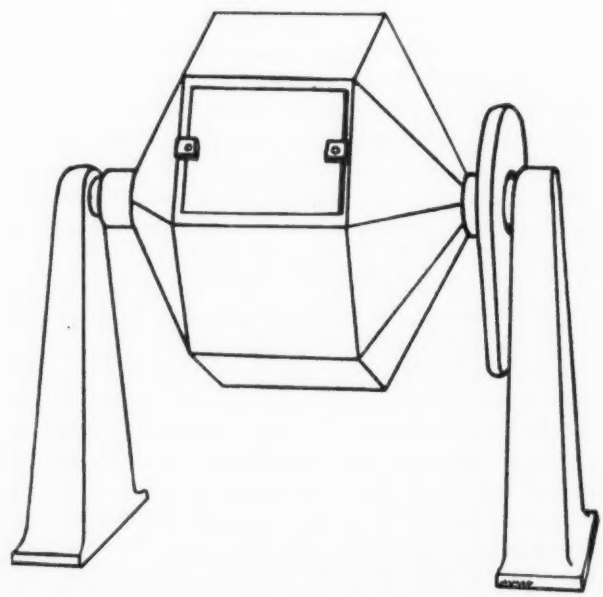
As was mentioned before, it is important that the different sizes of chips be kept segregated and that the chips be screened often. In spite of all these precautions the chips, in breaking up in the barrel, will at times wedge themselves in the openings and crevices of the parts being processed. This is especially true when complicated machined parts are being deburred. Though this situation is not serious, it is a nuisance that cannot be avoided. To remove these chips without marring the parts in any way, a dental pick is a very handy tool for this purpose. These picks can be bought in any war surplus store for a nominal sum.

At times aluminum parts with large flues or sprues on them, usually left in the casting or milling process, will be deburred in the barrel. These sprues are sometimes impossible to remove in a barrel. The barrel finishing process has a tendency to fold them over flat against the main body of the part so that, to the casual glance, the sprue seems to be part of the body.

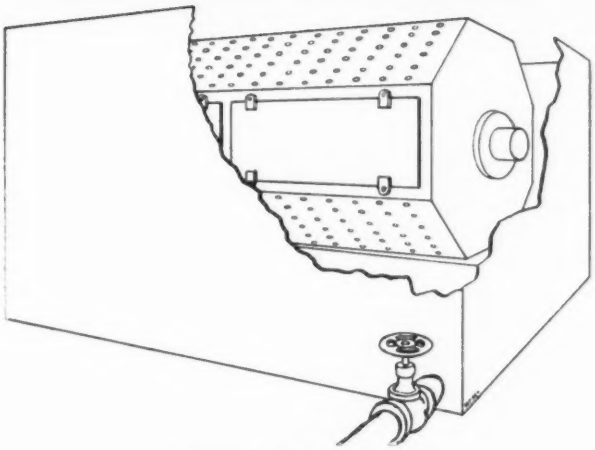
In experimental phases for removal of sprues, the barrel speed is set for a very low r.p.m. for the first two hours, then set to a normal operating speed for the next two hours. At that time, if the parts are not deburred or do not show a good sign of being deburred, then the deburring process should be routed elsewhere.

Aluminum components with class three threads, whether inside or outside, can safely be deburred in the barrels. The writer recommends, however, that the chips used for the above operation be no larger than ¼" x ⅛" in size. This is usually known as a #5 size. This procedure is also used in deburring gears while running them loose in a barrel.

Ring grooves at times will present some difficulty. The point to remember here is that the larger chip tends to peen over the groove edges. A compromise must be made between the size of chip to be used and the time consumed for the deburring cycle. Thin strips or blankings of aluminum are difficult to deburr be-



Triple Action Barrel



Submerged Horizontal Barrel

cause the parts tend to stick to the sides of the barrel. To combat this unwanted action, the operator should keep his water level low and try to cut down the lubricacy of the mass as much as possible.

If a continuous run of flat thin strip or discs is contemplated, the writer suggests purchasing a triple action barrel, the outline of which is drawn on preceding page.

From the sketch the reader can see that the tapered walls and the three way motion will tend to keep the flat discs and strips from adhering to the walls of the barrel.

Polishing aluminum alloys can be done by flushing out the grinding compounds in a barrel and replacing with a polishing compound. Water level is usually three to four inches above the mass in the barrel. However, to obtain high finishes, we must turn to the burnishing balls. These are hardened steel shot with a glass type finish. Used in conjunction with a burnishing compound, these steel balls will impart the best finish obtainable in a barrel.

Care must be taken to keep shot free from rust. It must be kept under water at all times or, once it is pitted from rust or corrosion, it will lose its burnishing or polishing ability. The operator must also be careful to use the right size shot so that it will not become wedged in holes and crevices of the parts being burnished. It is almost impossible to remove shot wedged this way without marring the part itself.

BRASS AND COPPER ALLOYS:

Practically the same rules apply in deburring copper and brass as in the case of aluminum alloys. Generally speaking, compounds used for aluminum can be used for brass and copper. However, the reverse is not always true. Some acid type compounds can be used on copper and brass which would be harmful to aluminum. The supplier's representative should be consulted in regard to this. Polishing or burnishing of copper and brass in barrels prior to plating has been a process used by jewelry manufacturers for years. Here too the glass hard steel shot and shapes are used with a burnishing compound. Submerged type barrels are best for this operation.

MAGNESIUM:

Great care should be taken in the processing of magnesium as the finely divided material is highly inflammable. For safety's sake deburring should be a wet process.

Due to the fact that magnesium reacts violently with certain chemicals, extreme caution should be used in choosing the right type of compound for processing magnesium parts in barrel finishing. The media can be either aluminum oxide or granite chips. Methods of operation as to speed, loading, etc., are similar to those of aluminum alloys. A submerged type of barrel with hardened steel shot as the media is recommended.

PLASTICS:

Barrel finishing plastics is usually a long and fairly tricky process. Due to the fact that the complete process can take several days time, depending upon the condition of the parts, it is profitable to run only small parts. However, if highly polished dies are used in the molding of plastic parts, two of the operations mentioned below can usually be eliminated.

It is generally agreed that there are four basic operations in barrel finishing plastics:

1. Definning
2. Cutting or ashing
3. Smoothing or semi-polishing
4. Final polishing or lustering

In the definning process which, to the author's knowledge, has always been a dry process, the parts are placed in an open mesh type barrel together with maple pegs and/or wooden balls. No abrasive compound is added as this compound would soon drop through the open mesh. In this operation, the burrs, fins, and unwanted slivers, drop out of the barrel and thus prevent scratching of the parts. The time element involved here is wholly dependent upon the size and shape of the fins.

Cutting down or ashing is usually done in a dry barrel. The media can be maple pegs and/or wooden balls. An abrasive is added for this operation. The barrel itself is lined with maple or hardwood. Ratio is about two parts of media and abrasive to one part of parts. R.p.m. of the barrel is adjusted to a speed at which no damage will result from pieces hitting each other.

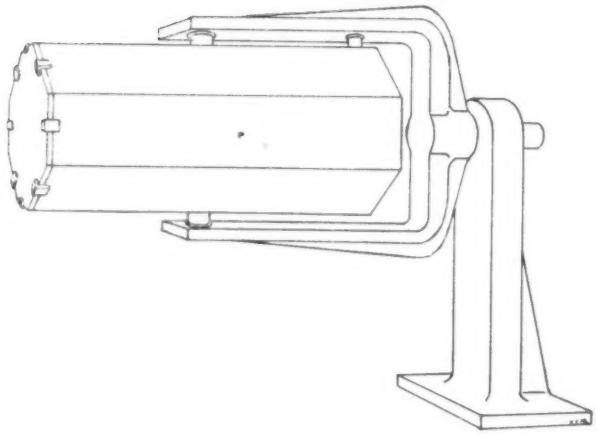
Another method of ashing is to pack a barrel with parts and chopped ice. The cover is left loose so that, as the ice melts, the water can seep out of the barrel. This method is usually effective on the acetate, vinyl and acrylic types of plastics. Time element involved in ashing is from four to sixteen hours.

Smoothing or semi-polishing is done in a dry barrel. Pegs and balls are used as the media with a special type compound added. Time involved can range up to fifteen hours.

Final finishing involves the use of a dry barrel, pegs and wooden balls and a very fine polishing cream. Up to 12 hours polishing time is consumed.

Prior to taking the parts from one stage to another, as stated above, the parts must be thoroughly cleaned of the abrasives left from the previous process. For fastest production results, it is suggested that four barrels be used, one for each of the above processes, and the parts transferred from barrel to barrel.

However, as was mentioned earlier, a highly pol-



End Loading Horizontal Barrel

ished plastic molding die will eliminate at least the first two of the above operations.

The reader will note that very little water is used in barrel finishing plastic parts. The amount of water in any process of barrel finishing plastics is just enough to make a paste of the compounds added to the media.

STEEL AND ITS ALLOYS:

Steel components can be, and usually are, deburred with highly alkaline compounds not recommended for aluminum alloys. Aluminum oxide chips are used as the media. Like aluminum, the harder the steel, the easier it is to deburr the part. The deburring cycle usually takes no longer than the cycle used in deburring aluminum.

Removing heat treat scale is done very efficiently in barrels. This can be done with the ordinary deburring compounds. However, to speed up the action, acid base compounds are now being used extensively.

A word of caution is in order regarding the use of acid compounds. The supplier should instruct the operator in the use of this compound and the types of materials that can be processed in it without any bad effects both to the material and the operator. The operator should use rubber gloves while working with any acid bearing compound. The barrel finishing area should be well ventilated. Finally, the water and acid compound, when it is being flushed out of the barrel should never be dumped into a sump where cyanide wastes also are being dumped.

When using acid compounds, the operator will soon note that the paint on and around the outside of the barrel is being stripped by the acid wastes. If extensive use of acid compounds is contemplated, the writer suggests painting the barrel with acid resistant paint such as is used to paint equipment in plating rooms. These paints are impervious to both acids and alkalies, and will prevent corrosion of the metal barrel itself. Screens, pans, etc. should also be painted. However, care should be taken to see that none of this paint gets back into the barrel.

Fine finishes can be obtained on steel parts by using a polishing compound with the aluminum oxide chips. Water level is kept high for this operation. Various experiments have shown that it takes about six to ten hours to achieve a 20 micro-inch finish where the finish was 40 at the start of the cycle.

From the writer's experience, it is suggested that all parts requiring a high finish be ground first. This will give the operator a 16 micro-inch finish at the start of his finishing cycle. He will then be able to obtain a 6 to 8 micro-inch finish within four hours.

All ferrous parts, with the exception of stainless or corrosion resistant steels, will soon rust after removal from the barrels. There are several types of rust inhibiting compounds which can be used in the barrels to prevent parts from rusting upon removal from same. Also there are various oils which will impart a film to the part and thus prevent rust from forming.

At times, however, it will be necessary for the steel parts to leave the barrel finishing department perfectly dry and with a high finish. In order to achieve this, it will be necessary to remove the parts from the deburring barrel, thoroughly wash them, spin dry them and then place them in an open-end barrel with sawdust. Boxwood or corn cob sawdust is recommended. It should be remembered that the sawdust must be kept as dry as possible. There are various ways of doing this. One of the most economical is to place an infrared lamp on a pedestal over the open end of the barrel before and during its operation.

One last word of advice regarding ferrous or steel parts — since steel has a greater specific gravity than aluminum, it is necessary to rotate the steel parts in the barrel at a slower speed in order to prevent peening of the parts. This usually holds true for the larger parts only.

ZINC:

Zinc-base die-castings have been a problem child to the barrel finisher for a long time. It has only been in the last year or so that a few compounds have been manufactured which have successfully finished these alloys.

One of the most successful ways of applying a finish to die castings is by the ball burnishing method. In addition to the hard steel shot and water, high titer soap chips are used as a burnishing compound.

However, in the deburring cycle we must revert to the aluminum oxide chips. To these chips is added a compound that has been formulated exclusively for zinc base castings. If this is not done, the operator is likely to find himself removing from the barrel castings on which a black film has formed. To remove this film it will be necessary to use an acid dip. If the operator has difficulty in obtaining a special compound for deburring or finishing die castings, he will find his best bet to be the soap chips or a similar soap base compound.

Finishes

As stated before, finishes can be obtained by flushing out the grinding compound and recharging with polishing compound in the same barrel. The longer the cycle the better the finish. However, to achieve the really fine finishes it will be necessary to go to the burnishing barrel. Jewelry manufacturers have used these barrels for years and, up to the present time, they are still the best and most economical for polishing parts.

The barrel is of the horizontal octagonal shape. It is perforated on all sides with holes from $\frac{1}{32}$" to $\frac{1}{8}$" diameter depending upon the size and type of work to be done. The barrel with all its contents is submerged

in a water tank with the water level just above the hubs or shafts of the barrel. Because the barrels are always in contact with water both inside and out, it is necessary that stainless steels or bronze materials be used in their construction, though wood barrels with bronze bushings have been used for years. However, the life of the wooden barrels is very short.

The media in these barrels is, of course, highly polished hard steel balls, pins or shapes. Ratio of media to work is about three to one. The purpose of the holes in the barrels is to let any minute chips or burrs to fall through to the bottom of the tank, thus preventing any possible scratching. Because of the perforations in the barrel, the water is both inside and outside the barrel at the same time. Therefore, in addition to the sliding action, we also have a "plowing through the water action" such as the bow of a boat breaking through the water. Because of this action, it will be necessary to run the barrels at a higher speed than in a normal deburring action. A speed of 50 r.p.m. for a thirty inch diameter barrel is not unduly fast. Of course, the r.p.m. is gauged by the type of parts that are being run.

The action of the burnishing media is a rolling and peening action on the surface of the parts being processed. This not only hardens the surface but also imparts a mirror finish to the part. It must be remembered, however, that small irregular shapes are best adapted to this type of processing.

No amount of ball burnishing can produce the finish on a flat surface that can be obtained by polishing with a wheel or buff. The operator must also bear in mind that, though fine finishes can be obtained by burnishing, these finishes though they might have the same micro-inch reading on the profilometer as parts honed on a standard honing machine, will not always react the same way in assembly.

The writer has many times finished a part to a 6 micro-inch finish, had it tested on a profilometer, passed through inspection, and then has been informed by assembly department that the assembly was leaking under high pressure due to inferior finishes. At the same time, a part that was honed on a standard honing machine performed satisfactorily. And, there have been times when the reverse was true. Therefore, only trial runs will usually prove out the finishes.

Finally, because of the fact that all burnishing and polishing compounds are more or less based on soaps and fatty elements, hot water should always be used in order to dissolve the compounds more thoroughly. To obtain the highest finishes possible, deionized water should be used.

Barrel Finishing Media

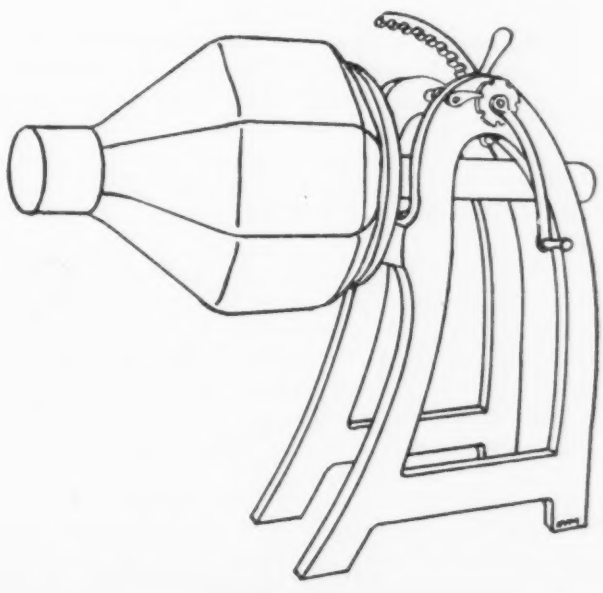
Various types of media have been manufactured and sold by various suppliers. The opinions stated below are based on the author's own experience with these types of media.

Vegetable ivory chips have been on the market for several years. These chips, combined with abrasive and a very small amount of coal oil, are practically always used dry for best results. The oil is used to prevent the fine abrasive in the mass from floating in the air space in the barrel. The writer also used to add hardwood sawdust to the mixture of vegetable ivory chips and abrasive. A pumice powder type (FFFF) was used with excellent results. This mixture is generally used for lightweight parts. It is also used as the last polishing operation prior to wet ball burnishing.

Rubber shapes or pellets impregnated with aluminum oxide grit is another media that has been in use for some time. This media can be used dry or wet. Usually no compounds are added as the grit imbedded in the rubber will deburr the parts. The price of this media is usually from five to seven times the price of aluminum oxide chips. This makes for an expensive initial cost. It is therefore not in general use.

A new media that has made its appearance recently is zinc base shapes and forms of all types. To the operator's mind will immediately come the thought that, due to the softness of zinc, this media will only be effective on the softer metals. Such is not the case. Combine the above media with abrasive compound and a good deburring action is obtained, even on hardened steels of all types. Also, the pointed shapes of this media does a better deburring job on the holes in the parts being processed than that obtained by using aluminum oxide chips.

The price of the zinc shapes is about double that of the aluminum oxide chips. Also, when using this media with the standard types of compounds in a closed, waterproof barrel, the friction and heat generated inside the barrel builds up such a pressure as to cause the lid of the barrel to be blown off. To offset this, the machine must either be stopped every fifteen minutes to release the safety valve or a special safety valve must be installed that will open with each revolution of the barrel. In view of this the author recommends that the zinc shapes be used only in open end barrels. Because of the fact that zinc is not chemically inert, as are the aluminum oxide chips, the reaction of the different compounds combined with this media will not always be the same. This will be found especially so in the polishing compounds.



Bottle Type Barrel

A novel barrel finishing operation is the removal of fins from molded rubber components. The parts are put in a barrel with dry ice, which freezes the rubber components to a brittle stage so that, in the tumbling process, the fins are broken and ground off the parts. (Note that we used the word tumbling. This is exactly what this operation is, as the parts are hitting one another, an action which is avoided in barrel finishing.) Equipment is now on the market which will pump carbon dioxide gas into the barrel under controlled pressure. This is quite an improvement over the dry ice method.

There are other types of media that can be used efficiently on different jobs.

Among these are granite, limestone and marble chips. Granite chips have a slower deburring and grinding action than aluminum oxide chips. However, if the operator intends to process only aluminum alloys and the softer metals, it is not at all unlikely that the granite chips would give good results. Then too, they are more economical to use. The limestone and marble chips are used mostly in polishing. Limestone chips, especially, have an excellent polishing action.

To the above we can add the Arkansas sandstone chips that have made their appearance during the last few years, and nylon and ceramic shapes.

In conclusion let us state that almost any type of media, from beach pebbles to lava stone can be used.

Fixture Machines

As the operator acquaints himself more fully with the possibilities of barrel finishing, he will find that, though tremendous savings could be incurred by barrel finishing large and weighty parts, it is not possible to process these parts loose. It is at this stage of the game that the various fixture machines come into their own. Some of these machines can be classified as barrel finishing equipment while others are in a class by themselves.

There are two types of fixture machines. One is the standard type of barrel with brackets on each end of the inside of the barrel. In the case of large gears or sprockets, for example, the parts are positioned, or slipped on a shaft, and the whole assembly fastened to the brackets in the barrel. The fixture is then either held stationary and the barrel with media rotated or the fixture and parts are rotated one way with the barrel revolving in the opposite direction.

In loading this type of barrel with media etc., no general rule can be applied. Each part must be engineered thoroughly as to the type of fixture, amount of parts to be run, cost of equipment, production costs, etc. The suppliers of these types of barrels should also assist the operator with all the engineering aid possible.

The other type of fixture machine cannot actually be classified as a barrel. Basically the machine is a large circular compartment into which the fixtured parts are placed. The compartment is then filled with abrasives recommended by the manufacturer. The abrasives or media cannot be too densely packed as the fixtured parts must move through this abrasive. The compartment rotates in one direction while the fixtured parts rotate in the other direction.

Here too, the operator must consult with the manufacturer's engineers for the best type of fixtures to be used and the type parts that can be best adapted to this kind of deburring process. This is an expensive piece of machinery compared to the ordinary barrel and is usually adaptable only to mass production of similar parts.

In addition to the machines mentioned above, there are many "built to order" deburring and polishing machines. These are so varied and complex that we shall not even attempt to list and classify them. Our purpose in this article has been solely to acquaint the average production man of the possibilities and savings that can be incurred by the use of barrel finishing.

As to future improvements in barrel finishing? These of course will be many. However, one much needed improvement is a form or shape to replace the aluminum oxide or granite chip. This shape should not fracture or break while in operation and should wear evenly on all sides. Thus the prime concern of the barrel finisher, chips lodged in holes, will be eliminated. Some of these shapes are even now being sold but, as yet, have not been able to successfully compete with the aluminum oxide chips. In the writer's opinion, however, it will be only a matter of time before forms and shapes will replace the standard aluminum oxide chips.

Proposed "Substitutes for Nickel Plating"*

By Dr. A. Kenneth Graham**

BEFORE speaking on the assigned subject, I must confess that I am disturbed by the necessity of talking about all plating as an industry when strictly according to definition it is not, since over 80% of the plating is done in captive departments of various end-product manufacturing concerns, and the government had defined the remaining 15-20%, i.e., the contract plating shops, as the industry.

I share the opinion of many that the use of substitutes for nickel plating might not be necessary if the distribution of the available nickel were made on a basis equitable to all end-use industries. Unfortunately, our industry has inherited the earlier inequity of distribution of the Korean period, whereby we received a much lower percentage of our base period quantity than other end-use industries. I fear this condition will continue unless the *actual* present-day requirements of all nickel using industries are realistically *re-evaluated* and then an adjustment in distribution is made accordingly.

An investigation of the *sources* of black market nickel also should prove illuminating in this respect. Our industry is obliged to purchase substantial quantities of black market nickel (i.e., all available) at a terrific cost *and even then* can not meet its requirements. It would appear to be the one industry being short-changed in allotment for this reason, and the largest users of nickel, the metallurgical industries, are not obliged to do this to my knowledge. Also, their activities in the black market over the years would be more generally known were this not so. But even this does not tell the whole story, since nickel allotted in excess of requirement to any group may be either stockpiled or sold on the black market. There should be no nickel available for the black market if it were equally distributed, and scrap were recast and reused, as is commonly practiced by the large plating users.

I have first-hand knowledge of the inaccuracies in estimating military requirements based upon my WPB experience, but if the present rate of government stockpiling is greater than actually necessary, the factor of safety this may provide is for our collective security. However, if the plating industry in a peace-time economy is *the only one to be strangled* because nickel is not made available, then the *distribution* of available nickel should be questioned, rather than the stockpiling program.

Because I believe the present situation should not be as bad as we in our industry find it, I hesitate to encourage the use of substitutes by talking about them. Furthermore, published statements about substitutes for nickel, whether true or exaggerated, and no matter how unsatisfactory the substitute may actually be, can often serve to worsen our plight. Public servants and others with little or no plating background, even if free from selfish motives, can not be too discriminating in their interpretations, and opinions cited by such individuals undoubtedly will continue to influence the thinking as to the necessity of nickel for plating, both in government and elsewhere.

In view of this, extravagant claims for substitutes for nickel plating can do our industry lasting harm, and a factual periodic review of the subject should be helpful. The facts as I know them are briefly these:

1. There is no satisfactory nickel-free bright chromium coating combination equivalent to conventional thicknesses of nickel-chromium for severe outdoor applications.
2. Electrodeposited substitutes for part or all of the nickel in most cases cost more than for all-nickel-chromium coatings and the quality is always lowered.
3. The use of supplemental clear organic coatings over electrodeposited substitute coatings does not give quality or performance equivalent to conventional nickel-chromium coatings and the cost may be increased.
4. Changes in treatment cycles, plating processes and equipment associated with the use of various proposed substitute coating combinations cause lost production time, are costly to make, and frequently are impossible because of space limitations.
5. If an amount of money equal to that already expended on the development of nickel processes were spent to improve the available proposed substitutes for nickel, they would still not be equivalent to nickel-chromium coatings in quality because the essential properties are lacking.
6. The nickel-free metal or alloy combination, which would equal or exceed the properties of nickel

*A paper delivered before the Detroit Branch of the American Electroplaters' Society, Inc., at its Annual Educational Session on December 2, 1955.

**President, Graham, Crowley and Associates, Inc., Jenkintown, Pa.

for protective and decorative coating applications in outdoor service, and could also be applied by electrodeposition, has not yet been developed.

The data given in the tables which have been distributed give information about the various proposed substitutes for nickel plating. These data have been compiled from a questionnaire which was sent to the companies and individuals listed. I wish to thank them for their cooperation.

These data are specifically for coatings on ferrous basis metals. No useful purpose can be served by discussing these data in detail, nor is there sufficient time available. The proposed substitutes in general are more suitable for indoor service, although such conditions have never been defined for test purposes with respect to the wide variations which may apply, and performance data must therefore be interpreted with reservations. Salt spray and humidity test data only indicate the continuity of coatings and the type of corrosion products which may form under these test con-

Table 1

Substitute Bright Chromium Coatings for Ni-Cr Over Ferrous Basis Metals (Final Chromium — 0.01 mil.)

	A	B	C	D	E	F	G	H
Pertinent Data	*Cu-Ni-Cr*	*Cu-Cr*	*(Cu + Sn)-Ni-Cr*	*(Cu + Sn)-Cr*	*Cr*	*Pb-Sb-Cr*	*W. Br-Cr*	*Cu-W. Br-Cr*
1. Is organic coating necessary?[1]	N	Y	N	Y	N, P	N	Y, N	N, P
2. Coating corrosion product in outdoor service	CS	CS	CS	CS	R	?	WR	WR
3. a—Outdoor applications[2]	B, G, T, H	B, G, T, H	All[2, *]	All[2, *]	T, (G)[2]	(T, B)[2]		(B, G)[2, 5]
b—Relative cost to Ni.	S	M	M	?	M	M	S, M	S, M
c—Required thickness, mils.								
Cu	.7-1.5	.5-1.						.3-1.5
Cu-Sn			1.-1.5	1-1.5				
Pb						.2		
Sb						1-1.5		
WB							.3	.2-1.5
Ni	.6-.5		.2-.5					.2-0
d—Service life, yr.	1.-2. (2-3)*	.1-.2 (.5-1.)*	1.5 (2-3)*	.6 (2-3)*	.1-.5	.5-2.	.1-.2	.1-.6
e—Life with organic coating, yr.		.16-.5		1.	.16			
4. a—Indoor applications	*H, T,* A	*H, T,* A	(H, T, A)*	(H, T, A)*		—	—	A, F, *H,* L, T
b—Relative cost to Ni	L, *S,* M	*L,* S, M	L, S, M	S	—	L, S	S	L, *S,* M
c—Service life, yr.	>2	>2	>8*	>8*				>2-(5)*
d—Life with organic coating, yr.	>2	2						>2
e—Required thickness, mils								
Cu	.4	.5						.1-.2
Cu-Sn			.3-.5	.5				
Pb					.2			
Sb					.5			
WB								.2-(2.5)*
Ni	.5		.2					(.2)[2]
5. Properties[4]:								
a—Hardness	M, *H*	*S,* M	M, *H*	*M,* H	H, *VH*	S	*M,* H	M, H
b—Brittle	N	N	N	N	Y	Y	Y	*Y,* N*
c—Ductility	P, *F*	F, *G*	F	F	P	P	P	P, *F* (M, G)[4]
d—Internal stress	L, M, *H*	L	*L,* M	L	H	M	M, *H*	*M,* H
e—Limited thickness							Y	Y
6. Relative rating** to ASTM Ni-Cr Specifications:								
a—Outdoor service	4-5	1-2	4	3	1-2	3-4	1-2	3
b—Indoor service	5	4	5	5	3	3-4	3	5

Notes: 1—Type organic (acrylic, melamine, alkyd).
2—Experimental.
*—Data from non-user.
**—Rating relative to Ni-Cr = 100% = 5; 80% = 4; 60% = 3; 40% = 2; 20% = 1.
3—Not recommended for outdoor use by supplier of low-copper white brass process.
4—Vary with conditions; underlined rating is average.

Table II

Abbreviations for Answering Questions Re Properties in Table I

Property No.	*Suggested Abbreviations*
1.	(a) Y—yes; N—no; P—if preferred.
	(b) Name type.
2.	CS—for copper stain; WR—for white rust; R—rust.
3.	(a) B—bumpers; G—guards; T—trim; H—hardware.
	(b) Example: 0.5 Cu / 0.2 Cr
	(c) S—same; M—more; L—less.
	(d) Examp'es: 6 mo.; 1.5 yr.
	(e) Example: 1.5 yr.
4.	(a) F—furniture; H—hardware; L—lamps; fixtures, etc.; T—trim; A—appliances
	(b) Example: 0.5 Cu + Sn / 0.2 Cr
	(c) S—same; M—more; L—less
	(d) Examples: 6 mo.; 1.5 yr.
	(e) Example: 1.5 yr.
5.	(a) S—soft; M—medium; H—hard; VH—very hard
	(b) Y—yes; N—no.
	(c) P—poor; F—fair; G—good
	(d) P—poor; F—fair; G—good; E—excellent
	(e) L—low; M—moderate; H—high
	(f) Example: 0.25
6.	Rating relative to Ni-Cr=100%=5; 80%=4; 60%=3; 40%=2; 20%=1.

ditions. They can not be correlated with respect to service life.

Our information on outdoor performance of plated coating combinations is much more complete, especially with respect to copper and/or nickel-chromium coatings, although salt spray and humidity test data are similarly limited. The suggested substitute coatings, other than a heavy buffed copper-substandard nickel-chromium combination, are wholly inadequate as substitutes for nickel-chromium in *severe* outdoor service. Substitution of a copper-tin alloy for copper in a combination coating using a thin nickel deposit and chromium has value, according to the British (CODAF)* report,[1] but does not materially change the above conclusion with respect to severe conditions, and the wide fluctuation in the cost and supply of tin is a matter of record. The British also reported that "none of the antimony deposits from known solutions were sufficiently ductile and adherent to promise commercial application."

There are other serious consequences of the present nickel situation which are wholly inconsistent with our concepts of free enterprise:

1. No company can get nickel to start plating its own products today if its name is not already listed as an established user of nickel.
2. Even if this company's products are currently being nickel-plated in job shops, this is still true.
3. Should the company substitute white brass, or something else, for nickel in order to do its own plating, the job shops presumably can still get the nickel, but not the company.
4. Supply houses to the plating industry have spent large sums of money on research in developing proprietary bright nickel and easy buff or levelling nickel processes. Some processes are preferred to others for given applications, or because of the properties of the nickel deposited. However, it is not uncommon for a user to select a process wholly on the basis of what supplier will give him nickel, rather than on the merits of the process. This is not free enterprise, and it is undoubtedly distasteful to suppliers and users alike.

In view of this dismal picture, one might properly ask which is most dependent upon nickel for its survival — the plating or the metallurgical industry? One might also ask what substitutions the metallurgical industries have been obliged to make, if any, or how many metallurgical concerns have been obliged to radically alter their manufacturing methods or products because of insufficient nickel in comparison to what has been happening in the plating industry since World War II. Casual inquiry regarding one large metallurgical company has confirmed that they have not been obliged to practice substitutions and have been allocated ample nickel for their needs.

As for substitutions in the metallurgical industries, a case in point is the fact that the Germans, because of a nickel shortage in World War II, developed a non-nickel bearing alloy for a given application which is superior in properties to the 8% nickel alloy used in this country. Since this information has been available over here, I have been advised that we are continuing to use nickel bearing alloys for this application, and that a 25% nickel alloy is now claimed to have properties equivalent to the German alloy.

The basic reason for our dilemma is the fact that the users of nickel plating, including the captive plating departments, have never been organized in a man-

Table III

Summary of Experience Using Substitute Finishes for Nickel-Chromium

	Usual Environment for Application			
	Outdoor (Severe)		*Indoor (Mild)*	
	*Coatings**	*Service Life, yr.*	*Coatings**	*Service Life, yr.*
1. *Automotive*:				
(a) Bumpers and guards	A (1.-.5-.01)	.5		
	A (1.5-.5-.01)	2.		
	A	2-3**		
	B	.5-1**		
	C	2-3**		
	D (1.5-.01)	.5-1.+		
	D	2-3**		
	F (.2-.2-1.5-.01)	.5+		
	G (.3-.01)	.25+		
	H (.5-1.-.01)	.25+		
(b) Hardware	BO	.16	B (.5-.01)	>2
(c) Trim	A (1.-.5-.01)	.5	B (.5-.01)	>2
	BO (1.-.01-.75)	.16	G	4**
2. *Hardware*: Builders and cabinet			B	>3**
			D	>8**
			G	>4**
3. *Metal Furniture*			A, G, H	>4**
4. *Household appliances*			B (.7-.01)	>5
			A, H, G	>4**

*If coating includes organic film, letter "O" is added after letter designation—for examp'e: BO.
**Data from a non-user.
+Experimental.

ner to represent the industry as a whole so as to protect its interests. During both the second World War and the Korean affair, for example, the copper, zinc, lead, steel, and other industries were represented in Washington by government-appointed Industry Advisory Committees. These were consulted with respect to any orders or legislation affecting their industry. The plating industry was represented only by a job shop Industry Advisory Committee (approximately 15% of the plating industry) during the Korean affair, and had no representation during World War II, the period during which the philosophy of how scarce materials were to be controlled and distributed was established. Furthermore, unlike copper, zinc, lead, and steel, nickel was not handled in a WPB divisions of its own, but by a section of the Alloy Steel Branch of the Iron and Steel Division. A similar arrangement continued through the Korean period in NPA, and in the Department of Commerce organization later. This meant that any decision involving the amount of nickel the plating industry received was determined within the Iron and Steel Division, which represents the largest nickel end-use industry. If the situation was reversed, one wonders how long the steel industry would have allowed the plating industry, in effect, to handle their allocation of nickel?

There is also reason to believe that this conflict in interest with respect to the nickel end-use industries exists within the nickel-producing companies themselves. The fact that the major nickel producer is currently handling nickel allocations is no cause for optimism, since the basis for handling nickel orginated with this company in the first place and the same philosophy for distribution appears to prevail today. To correct this situation our industry should endeavor:—

1. To dispel the idea that nickel plating isn't necessary and that we have satisfactory substitutes for nickel,
2. To obtain a realistic evaluation of the actual present-day requirements of all the nickel end-use industries,
3. To seek a re-allocation of nickel to end-use industries on the above basis, and
4. To organize all the *users* of nickel plating so as to be able to better accomplish these objectives and to protect their interest.

In conclusion may I say it is not possible for me to accept the idea that our extensive plating activities can not be defined and organized in some fashion so as to receive the treatment accorded an industry. Nor can I accept the idea that a truly representative group of the plating industry should not be able to initiate some constructive action. An impartial investigation of the handling of nickel is long over due.

[1]Report on an outdoor evaluation program of alternate finishes. Electroplating and Metal Finishing, **8**, 9 (1955).

[*]Cooperative Development of Alternate Finishes Group formed by a number of the larger manufacting companies interested in electroplating.

Typical Comments from Collaborators

(1) "Field tryouts were made with bright chromium over buffed speculum (55% Cu—45% Sn) 0.7 mil thick and were not satisfactory. After six months (indoors) these cabinets looked like new. After one and one-half years service some copper corrosion products and rust appeared and after two years service considerable rust and customer dissatisfaction developed."

(2) A coating comprising (0.3—0.8 mil) copper — (0.01 mil) chromium and (0.4—1.0 mil) clear organic — "proved satisfactory on outdoor exposure until clear synthetic enamel film failed. Then the piece, in addition to presenting an unsatisfactory appearance because of unsatisfactory condition of the synthetic enamel, tended to turn a reddish brown color and/or rust because of copper and/or basis metal corrosion."

"Synthetic enamel failure which, in any case seemed to occur within one to two years, might occur sooner, depending upon the care with which the chromium plated surface was prepared to receive the organic film."

(3) "Copper-chromium plated interior (car) parts — are still satisfactory after two years service."

"White brass-chromium plating — on certain interior steel (car) parts — as far as we know, — are still satisfactory."

(4) "A very considerable effort was made to use lead-antimony-chromium sequence with and without an undercoat of copper. — Experimental pieces of the most part failed within a few months in the Detroit area (outdoor service) due to the appearance of black spots and obvious cracks in the deposits."

(5) "It is our experience that no clear lacquer or baked enamel is satisfactory for outdoor exposure. The life of these coatings may be only a few days, and not more than six months. Such coatings flake and/or peel within this period and become very unsightly."

(6) "At the present time we are paying a terrific premium for a considerable portion of the nickel which we are using."

(7) "We have no nearly satisfactory substitute for nickel-chromium coatings for outdoor exposure, and very few partially satisfactory for indoor use."

(8) "Bronze-chromium is no better than copper-chromium. Bronze-nickel is somewhat better than copper-nickel. Antimony, — some very good and some very bad service results."

Collaborators

Company	*Individual*
Battelle Memorial Institute	Dr. Charles L. Faust
Chrysler Corporation	Donald M. Bigge
Doehler-Jarvis Division, National Lead Company	Lyman B. Sperry
E. I. duPont De Nemours & Co.	Dr. H. L. Benner
Ford Motor Company	Henry Kafarski
General Motors Corporation	C. F. Nixon
Hanson-Van Winkle-Munning Co.	M. B. Diggin
The Harshaw Chemical Company	A. H. DuRose
Houdaille-Hershey Corporation	W. L. Pinner
The National Cash Register Co.	Walter E. Moline
Promat Division, Poor and Co.	Harold A. Kahler
Sunbeam Corporation	B. C. Case
The Udylite Corporation	Dr. R. B. Saltonstall

The questionnaire was sent to 24 individuals, all of whom replied. However, only 13 had data available.

Science for Electroplaters

11. Electrolytes

By L. Serota

AN important property of solutions of acids, bases or salts is the ability to conduct current. Electrotyping, electrocleaning, and electropolishing operations are based upon this property. The term electrolysis is applied to such electrochemical reactions, and the solutions involved are called electrolytes. Degreasing agents such as trichlorethylene, or most brighteners, are not conductors of electricity and belong to a class of compounds called non-electrolytes.

As early as 1800 it was found that water solutions of acids, bases and salts are conductors of electricity. Alessandro Volta reported the development of a battery which changed the energy of a chemical reaction into electricity. The battery was made by placing two sheets of different metals such as copper and zinc together and wrapping them in a flannel soaked with salt water. This is known as the "voltaic pile." This type of battery was used shortly thereafter to decompose water into oxygen and hydrogen; and in 1807 Sir Humphry Davy decomposed alkali salts by means of electric current and obtained, for the first time metallic sodium and potassium.

Faraday's Law

The relationship of current flow in a solution to the chemical action at the electrode was established quantitatively by Michael Faraday in 1833. He showed, on the basis of experimental evidence, that the quantity of chemical action was proportional to the current, and that the same quantity of electricity (96,500 coulombs) would deposit equivalent weights of any substance. This quantity of electricity, a fundamental unit in calculations relating to electrochemical reactions, is the basis for computing the amount of electrodeposited metals and is called a *faraday*, in his honor.

A coulomb represents the quantity of electricity that is transferred in one second by one ampere. If, for example, the ammeter for a silver cyanide bath indicates 75 amperes, the equivalent weight of silver 107.88 grams will be deposited in $\frac{96{,}500}{75} = 1287$ seconds; or $\frac{1287}{60} = 21.5$ minutes. Coulombs equal amperes $\times$ seconds, hence $75 \times 1287 = 96{,}500$ (approx.) coulombs or one *faraday*. A table containing electrochemical equivalents for electrodeposited metals in terms of thickness in inches of 1 oz./sq. ft. and in ampere-hours required per square foot to deposit 0.001 inch will be found in the METAL FINISHING GUIDEBOOK.

Faraday observed that the reactions occur at the electrodes and not in the remaining portion of the solution, indicating a flow in opposite directions of positive and negative charged particles which he called ions or wanderers (from Greek verb ienai, to go or travel). To the ions which move in the direction of flow of positive electricity (downstream) the name cation (Greek, kata = downward) was given. These ions move toward the cathode, the negative electrode. Ions that move in the opposite direction (upstream) were called anions (Greek, ana = upwards) and moved towards the anode, the positive electrode (Fig. 28).

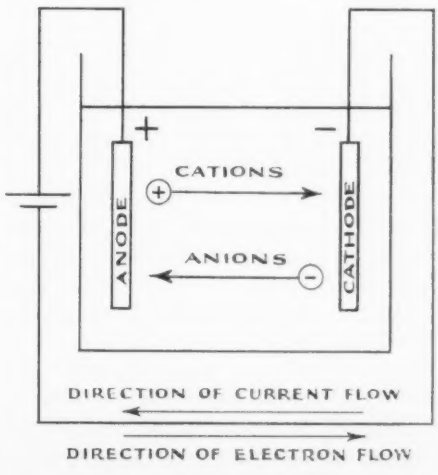


Fig. 28

An early attempt to explain these reactions was made in 1805 by T. Von Grotthus, who assumed that the decomposition of the molecule is caused by the electric current. Additional interpretations for the changes occurring in electrolytic solutions during passage of current were advanced, but the accumulation of evidence was correlated and presented in the form of a satisfactory theory by Svante Arrhenius who, in 1887, assumed in his hypothesis the spontaneous dissociation of the electrolyte into ions. This was in agreement with the observed difference in such properties as freezing point, boiling point, vapor pressure and osmotic pressure (known as colligative properties), compared to those of non-electrolytes, a relationship first pointed out by Arrhenius. Equimolecular solutions of non-electrolytes, such as sugars, alcohols and other substances, have the same freezing point, osmotic pressure, etc. For the same concentration of acids, bases and salts, however, greater osmotic pressures, lower freezing points and higher boiling points are obtained. These values increase with increased dilution. One mol of glucose or any non-electrolyte dissolved in 1000 grams of water will freeze at—1.855°C. This deviation can be explained in terms of Arrhenius' theory.

Ionization

The theory of ionization presented by Arrhenius may be summarized as follows:

Solutions of acids, bases and salts ionize (dissociate), in varying degrees, into positive and negative ions. These ions move about freely and are attracted towards the appropriate electrode when an electromotive force (emf) is applied. The charge on the ion is neutralized at the electrode, thereby changing the ion to an atom or molecule.

Ionization of the electrolyte increases with greater dilution, resulting in an equilibrium between the unionized molecules and ions. The apparent degree of dissociation at moderate dilution will vary, depending upon the electrolyte, ranging from 1 per cent as with acetic acid and ammonium hydroxide (weak electrolytes), to the high value of 90 per cent for sodium hydroxide and hydrochloric acid (strong electrolytes). In this classification salts are generally strong electrolytes or good conductors. At in-

finite dilution, it is assumed that electrolytes are completely dissociated.

It is evident that acids and bases vary considerably from those which are slightly ionized (weak electrolytes), to highly ionized, strong electrolytes. Acids, such as hydrochloric, nitric, sulphuric, are strong acids because they dissociate to a great extent, furnishing many ions. Bases such as sodium hydroxide and potassium hydroxide have strong basic properties because of the high concentration of hydroxyl ions.

A 0.1 N copper sulphate solution is only 40 per cent ionized (at 25°C.). To increase the conductivity or reduce the resistivity of an acid copper sulphate bath, sulphuric acid is added. The variation in resistivity for several concentrations of copper sulphate-sulphuric acid solutions at 25°C. in ohm-cm. is evident from the following values:

50 g./l. $CuSO_4 \cdot 5H_2O$ = 65 ohm-cm.
50 g./l. $CuSO_4 \cdot 5H_2O$ + 50 g./l. H_2SO_4 = 4.9 ohm-cm.
200 g./l. $CuSO_4 \cdot 5H_2O$ = 24 ohm-cm.
200 g./l. $CuSO_4 \cdot 5H_2O$ + 50 g./l. H_2SO_4 = 5.5 ohm-cm.

The practical value of this factor in plating operations is seen when, by increasing the free acid (sulphuric) concentration from 13.4 oz./gal. to 26.8 oz./gal. in electrorefining baths, the resistivity of the solution is reduced from 4.2 to 1.6 ohm/cc.[3]

Modification of the Arrhenius theory of dissociation became necessary with the development of the modern atomic theory and the evidence by x-rays of the existence of ions in solid salt crystals. This means that salts, when dissolved in water, are completely ionized, the solvent merely tending to split or separate groups of ions (Fig. 29), a factor associated with the high dielectric constant (80) of water. This constant accounts, in a measure, for the high ionization of acids, bases, and salts in water. The effect produced is the reduction of the valence or inter-ionic forces. The dielectric constant represents the force with which two electrical charges will be attracted or repelled in different media. The dielectric constant of a vacuum and of air is 1. This force is inversely proportional to the dielectric constant of the medium. Coulomb's Law relates to such electric force. He proved that the force acting between two charges is directly proportional to the square of the distance between them. An increase in conductivity is ascribed, therefore, to greater activity of the ions and not, as was assumed by Arrhenius, to an increase in the number of ions.

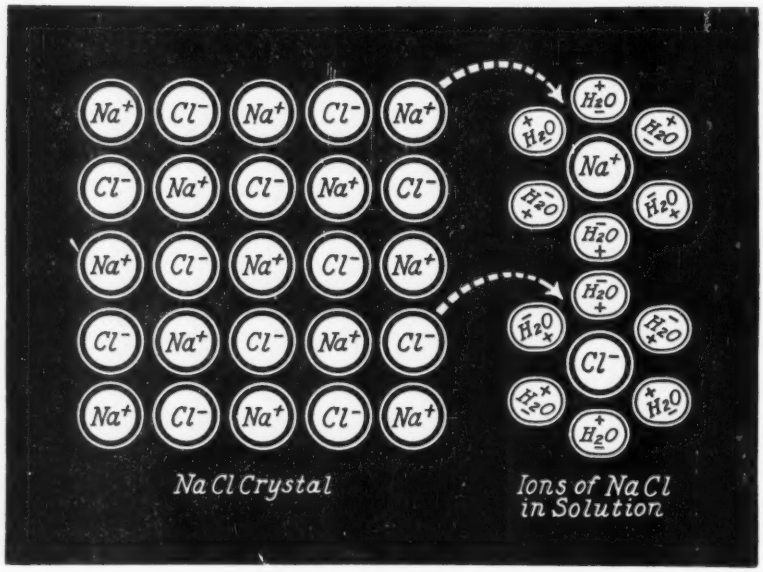


Fig. 29. How Dissociation Occurs.

Electrovalent (polar) compounds, such as the salt of metals (with some exceptions like mercuric chloride) and metal hydroxides, are assumed to be completely ionized. The theory of dissociation advanced by Arrhenius may be assumed, however, to hold for non-polar compounds. Acids such as hydrogen chloride, which is a non-conductor in the liquid state, or bases such as ammonium hydroxide containing an ion radical held by a covalent bond, are included in this classification. Such compounds, when dissolved in water, give evidence of forming the hydrated hydrogen ion $(H_3O)^+$.

Water (aqueous) solutions of electrolytes, specifically those of the transition elements (metals) result, in many instances, in the formation of simple and complex ions exhibiting characteristic colors. The blue-green color of the copper ion (Cu^{++}) in the acid-copper sulphate bath, the green nickel ion (Ni^{++}) in the nickel bath, the red complex dichromate ion $(Cr_2O_7^{--})$ in the chromium bath or the pink complex permanganate ion (MnO_4^-) of the compound potassium permanganate, used for the removal of chromium as an impurity in the nickel bath, are examples familiar to the plater. This characteristic is associated with incomplete inner electron groups. For example, the colorless cuprous ion, Cu^+, from cuprous cyanide, CuCN, is explained by the presence of the completed eighteen electron shell next to the outermost group, the single electron having been removed from the valence shell. The electronic arrangement for the cuprous ion becomes therefore 2, 8, 18. The formation of the blue-green cupric ion requires the removal of the additional electron from the inner 18 electron group, resulting in an incomplete inner shell 2, 8, 17. Silver exists as the colorless silver ion, Ag^+, because only the single valence electron (outer shell can be detached readily.

Ion Replacement

In the pickling of steel, the formation and release of hydrogen involves the ionic reaction whereby the hydrogen ion from the acid, sulphuric or hydrochloric, is displaced or liberated by the metal, iron going into solution as the ferrous ion. A transfer of electrons from the iron to the hydrogen ion occurs in this chemical reaction. The iron, in giving up its electrons and changing to the ferrous ion, is oxidized. The hydrogen ion, in gaining an electron and changing to the atom, is reduced. The atoms unite to form hydrogen molecules, which escape as a gas. These changes may be represented by the following ionic equations.

1. $Fe + 2H^+ \rightarrow Fe^{++} + H_2$ (gas)
2. $Fe \rightarrow Fe^{++} + 2e$ (electrons) (oxidation)
3. $2H^+ + 2e \rightarrow H_2$ (gas) (reduction)

The anion does not take part in the ionic reaction providing the salts are soluble.

A similar reaction occurs when copper is immersed in a silver plating bath. The ionic reaction involves the transfer

of electrons from the copper, which is more active, to the silver ion, resulting in a deposit of silver, while copper changes to the ion and goes into solution. The silver ion, changing to metallic silver, is reduced; and the metallic copper, changing to the copper ion, is oxidized.

4. $Cu + 2Ag^{+} \rightarrow Cu^{++} + 2Ag$
5. $Cu \rightarrow Cu^{++} + 2e$ (oxidation)
6. $2Ag^{+} + 2e \rightarrow 2Ag$ (reduction)

Single Electrode Potentials

The energy liberated in such reactions could be converted to electrical energy by placing the ion (as an electrode) in a solution of ferrous ions, and a platinum or carbon electrode in a solution of acid (hydrogen ions). Separation of the solutions by a porous partition is necessary to prevent direct chemical action (oxidation of iron). When current is taken from such a cell, iron is converted to the ferrous ion (equation 2) thus furnishing electrons to the circuit. The hydrogen ions gain these electrons at the platinum or carbon electrode (equation 3) changing to hydrogen. The electrical energy (voltage) of such cells, resulting from the chemical reaction, will depend upon the quantities of the reacting substances. Accordingly, the ferrous ion concentration in its section of the cell should be low, so that the ions which form can dissolve, whereas the hydrogen ion concentration should be high, since these ions change to the atom and are removed from solution as a gas.

When a metal is dipped into a solution containing ions of the metal, a potential difference between the electrode and the solution is established (electrode reaction), in much the same manner as the total voltage of a cell serves as a measure of the oxidation-reduction reaction. Measurement of potentials for such electrode reactions cannot be made other than by comparison with the voltage of a reference electrode, an arbitrary chosen standard. The values for such electrode reaction voltages are known as oxidation-reduction potentials or *single electrode potentials*. It is also referred to as electrolytic solution pressure. The universal standard is the hydrogen electrode reaction obtained by bubbling the gas, at 1 atmosphere pressure, over a platinum black electrode which is immersed in a normal solution of hydrogen ions. (Values are also determined for a molar solution.) The voltage for this electrode reaction, $H_2 \rightarrow 2H^{+} + 2e$, is listed as $\pm$ 0.000 volt.

Table I
Electrolytic Potentials

Electrode reaction	*Standard Potential (volts)*	*Electrode reaction*	*Standard Potential (volts)*
$Zn = Zn^{++} + 2e$	$+0.763$	$Pb = Pb^{++} + 2e$	$+0.126$
$Cr = Cr^{+++} + 3e$	$+0.74$	$H_2 = 2H^{+} + 2e$	0.00
$Fe = Fe^{++} + 2e$	$+0.44$	$Cu = Cu^{++} + 2e$	-0.337
$Cd = Cd^{++} + 2e$	$+0.403$	$Cu = Cu^{+} + 1e$	-0.521
$In = In^{+++} + 3e$	$+0.342$	$2Hg = Hg_2^{++} + 2e$	-0.789
$Co = Co^{++} + 2e$	$+0.277$	$Ag = Ag^{+} + 1e$	-0.799
$Ni = Ni^{++} + 2e$	$+0.250$	$Au = Au^{+++} + 3e$	-1.50
$Sn = Sn^{++} + 2e$	$+0.136$	$Au = Au^{+} + 1e$	-1.68

Values referred to hydrogen-hydrogen ion couple as zero are for unit molal activities.

If pure iron immersed in an equimolar (or normal) solution of ferrous ion serves as one electrode and the hydrogen electrode is used for completing the cell arrangement, the value for this cell reaction will be + 0.44 volt. Some references give this value —0.44 volt. The calomel electrode is generally used as the reference electrode because it is more convenient. The potential for an electrode reaction involving a loss of electrons is known as an oxidation potential. Electrode reactions that entail a gain of electrons are called reduction potentials.

Standard oxidation potential refers, therefore, to the tendency of an element or ion to lose electrons, thereby becoming oxidized to a higher positive value (valence). The greater this positive potential value, the more readily will the metal give up electrons and change to the ionic state. It is evident that a series of such standard potentials (single potentials), referred to the hydrogen scale, will be a measure of the relative activities of metals. This is called the *electromotive series.*
The table indicates the order in which metals will displace each other from solution. Metals like nickel and chromium will show more positive potentails when they are passive. A metal with a more positive potential value will displace from solution a metal that follows it; e.g., iron or zinc will displace copper from a solution of a copper salt, and copper will displace silver from solution. Metals above hydrogen in this list will, when immersed in a normal (or molar) solution of hydrogen ion, displace hydrogen and liberate it as a gas. Copper, which is below hydrogen, with an oxidation potential of —0.34 volt, should not displace hydrogen from solution.

When copper dissolves in potassium cyanide solution, however, hydrogen is liberated. This is explained by the fact that the dissolved copper is present in the form of complex ions, thereby reducing the cupric ions to a very small value in relation to the hydrogen ions. An application of this principle is to be found in the use of a strike solution. A silver strike solution consists of a high free cyanide and a low silver content. This proportion results in a sufficiently low silver ion concentration in the solution so that the tendency of silver deposition by immersion or the replacement of silver ions in solution is greatly reduced. This factor of immersion deposition was stressed in a discussion panel relating to a paper on silver plating, published in the 1941 edition of MODERN ELECTROPLATING. One of the authors, D. Wood, in answer to a question, contended that a copper strike before silver is not generally acceptable because of the probability of poor adhesion, due to the immersion deposit of silver on the copper.

A number of immersion or displacement plating processes based on the electromotive series have been described recently in the METAL FINISHING GUIDEBOOK. Several tin displacement processes are mentioned, such as immersion plating of copper and its alloys with tin from a potassium stannate-potassium cyanide bath; the immersion plating of aluminum alloy pistons with tin from a potassium or sodium stannate bath; and a method for immersion plating of steel with tin and copper, from a stannous sulfate-copper sulphate bath. This process, called "brass" on steel, has been practiced in the wire industry for many years.

SHOP PROBLEMS

ABRASIVE METHODS SURFACE TREATMENTS CONTROL
ELECTROPLATING CLEANING PICKLING TESTING



METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Decorative Chromium

Question: We have been experiencing trouble with decorative chromium plating. Our bath is a 46 oz. solution and contains a wetting agent.

We operate the solution at 110°F., directly after nickel and water rinse. Periodically, a small white or frosty spotty appearance is produced. With strenuous buffing, this is removed. Although the majority of the area is brightly plated, a small amount is left with this irregular finish. What can we do to eliminate same?

A. A. C.

Answer: The condition may be due to passive nickel. You can check for this condition by buffing the nickel plate before chromium plating. If buffing removes the discoloration effect, the passivity can be minimized by using a cathodic cleaner after nickel plating, followed by a 20% sulfuric acid dip, preferably containing a nickel activator.

If the condition is in the chromium, an analysis of the solution is suggested.

Source of Licorice

Question: We would appreciate your indicating to us names and addresses of suppliers of Licorice for zinc plating. It will be needed for galvanizing of our seamless pipe.

M. N.

Answer: Licorice root extract is generally sold by pharmaceutical and confectioners' supply houses. It is not an item obtainable from plating supply houses.

Depositing Brazing Alloys

Question: We are seeking information on the possibility of electroplating a silver brazing alloy, with a flow point of under 1,500°F. Such an alloy would have a typical composition of 50% silver, 34% copper and 16% zinc. It would be appreciated if you can offer information on a commercial process, or to literature references.

R. L. F.

Answer: Our files show no method for depositing alloys of these three metals, either commercial or experimental. However, alloys of copper and zinc can be deposited in almost any desired ratio by varying the salt concentrations and operating conditions of the cyanide bath.

Hard Chromium Specifications

Question: We receive requests from time to time for furnishing our rings with a hard chrome finish, or recommending a specification which would adequately do the job. Since these rings are hardened to a Rockwell of approximately Rc 50 in many cases, certain precautions have to be taken care of in order to avoid any embrittling effect.

We have had a suggestion of using MIL-P-6871 Type II on these rings, but we are unable to obtain a copy. Would it be possible to obtain a copy of this and also other specifications which would be pertinent to plating hardened retaining rings? In the event that this data is not available directly from you, perhaps you can recommend to us the proper party to contact.

J. C. P.

Answer: Specification MIL-P-6871, Type II, calls for a minimum of 0.002" chromium. Class A deposits are plated to dimension, while Class B deposits are ground to dimension after plating. All parts having a hardness above Rockwell C-40 must be heated at 350-400 deg. F. for 3 hours to minimize hydrogen embrittlement, after plating.

Copies of this specification may be obtained from the Commanding General, Air Materiel Command, Wright-Patterson Air Force Base, Dayton, Ohio.

Engraving Anodized Aluminum

Question: We are enclosing three samples. The first is a simple blank, the second is simple blank which has been polished and engraved. The third piece has been anodized and the engraving is a slow and costly operation.

In the process of experimenting we have found that it is possible to engrave these parts by machine, but the highlights do not appear. Since there is an altogether different action between these two types of engraving, naturally there will be different results. It is after the machine engraving that the rough surface appears, and it is this surface that we would like to brighten. Do you think it is possible to get a bright finish on the machine engraving? The alloy we are using is 50S aluminum. Do you think it would be advisable to sand blast these parts? We are not familiar with the process and would appreciate whatever assistance you can render.

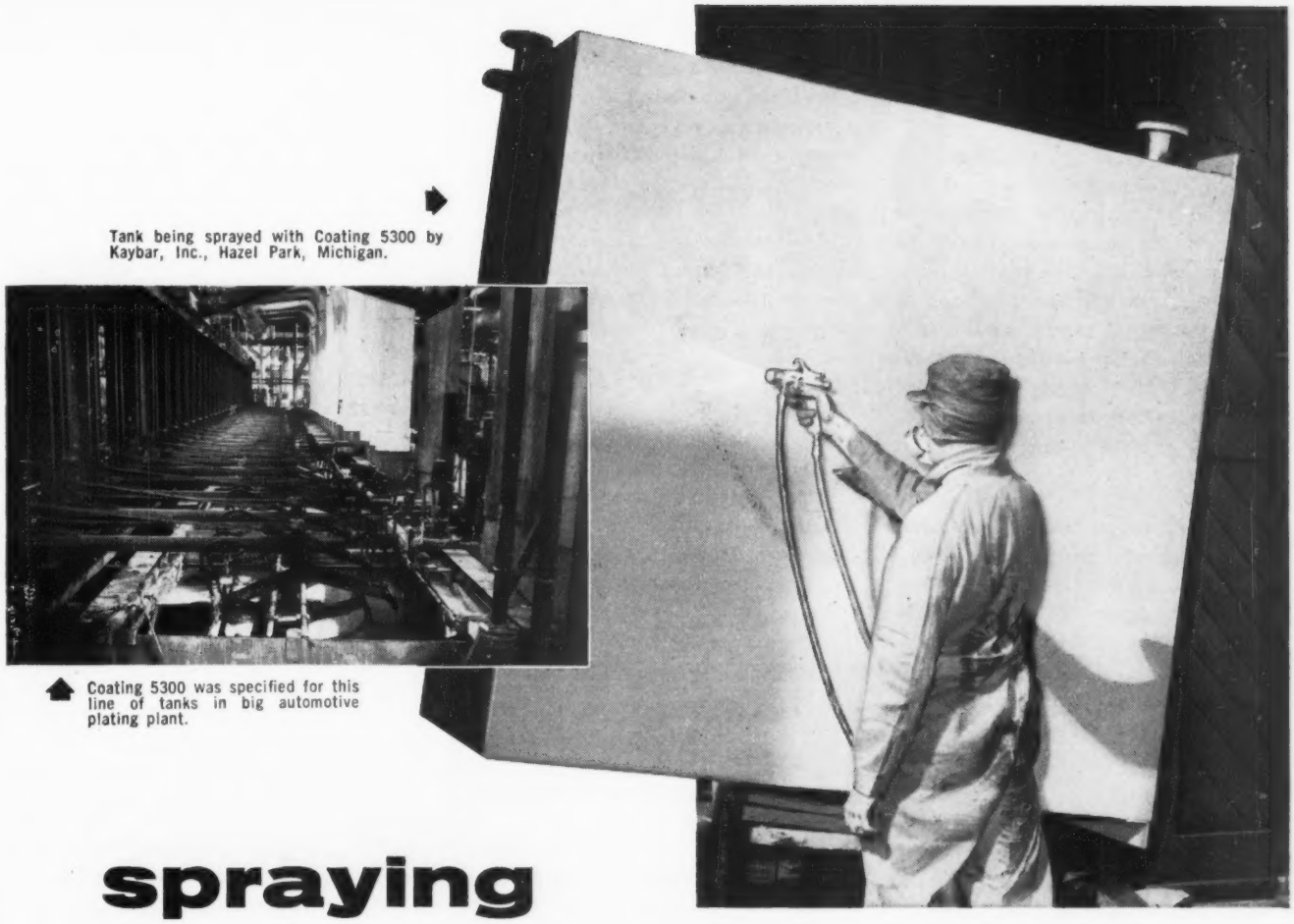
R. M. L.

Answer: The machine engraved sample has been engraved after anodizing and, under magnification, dyed bits of oxide film can be seen embedded in the engraving, forced in by the engraving tool. We believe that this causes the dark appearance in the engraving.

We do not know of any dip which will clean up the recesses without attacking the dyed surface. The only alternative is to engrave before anodizing and then fill in the engraving with a stop-off lacquer.

Fluorides in Water Supply

Question: With many cities adding sodium fluoride to their drinking



Tank being sprayed with Coating 5300 by Kaybar, Inc., Hazel Park, Michigan.

Coating 5300 was specified for this line of tanks in big automotive plating plant.

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This plastisol applies easily to tanks, ducts, drainboards and other equipment. It cures at 350° to 365° F. Coating 5300 won't chip and has high insulation value and exceptional toughness. It withstands all plating and cleaning solutions.

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water, we were wondering if the fluoride in the amount of 1 part per million would have an adverse effect on electroplating or cleaning?

Our Public Health Committee has done a considerable amount of research on the subject of fluoridation and one of the persons we discussed the project with is in the plating business and is of the opinion that fluoride added to our water supply would have a bad effect on the plating processes. Would you please supply us with as much information as is available on the subject? Thank you.

K. A. S.

Answer: Fluoride, being of the same family of elements as chloride, is undesirable in certain metal finishing operations because of corrosion of equipment such as steel tanks and piping, when present in appreciable amounts. In other operations, such as nickel plating, it would not be considered a harmful constituent of the water supply.

However, since its action is similar to that of chloride, a concentration of only 1 part per million would be considered inconsequential from a practical standpoint, in view of the fact that even an exceptionally pure water such as would be obtained from the New York City system contains more than 7½ p.p.m. of chlorides.

Cadmium-Copper Alloy Bath

Question: We are interested in electroplating a copper-cadmium alloy. The only recent reference that we have found is a bath composition published on page 82 of the 1947 GUIDEBOOK-DIRECTORY. If you could furnish us with further references on this bath and on others, if any, we would be most appreciative.

E. V. R.

Answer: The only additional reference in our files on the subject is: E. E. Longhurst, J. Electrodepositors Tech. Soc., 25, advance copy No. 5(1950).

The following details were disclosed:

Copper cyanide	26.9 g./l.
Cadmium cyanide	4.1 "
Sodium cyanide	34.8 "

pH: 10-12 Temp.: 25-45°C.
C.D.: 2-20 amp./sq. ft.
Deposits: 28-50% copper

Colored Aluminum

Question: We are enclosing a sample of colored aluminum chain for your examination. Will you please advise the type of finish and how it can be duplicated?

R. P. V.

Answer: The sample was produced by bright dipping the aluminum, anodizing and finally dyeing the surface with a pink gold colored dye.

Cold Solvent Degreasing

Question: We are interested in cold solvent degreasing. Could you answer the following questions for us?

It it practical prior to a nickel-chrome plating cycle? If so, is a rinse necessary before entering a soak-clean, electric reverse clean. rinse, acid, rinse cleaning cycle? How great is the danger of contaminating the cleaner? How great is the danger of contaminating the nickel?

Isn't it true that the drag-out loss is much higher in a cold solvent than a vapor-spray-vapor degreaser which produces a dry product; and if true, where is the economy?

R. A.

Answer: These solvents can be used prior to plating and no rinse is necessary before entering the alkaline cleaner. If the parts are drained properly after degreasing there would be no contamination of the cleaner.

Drag-out loss is higher but the cold solvents are more economical to use because of the lower selling price. It must also be remembered that there are losses from a solvent vapor degreaser also.

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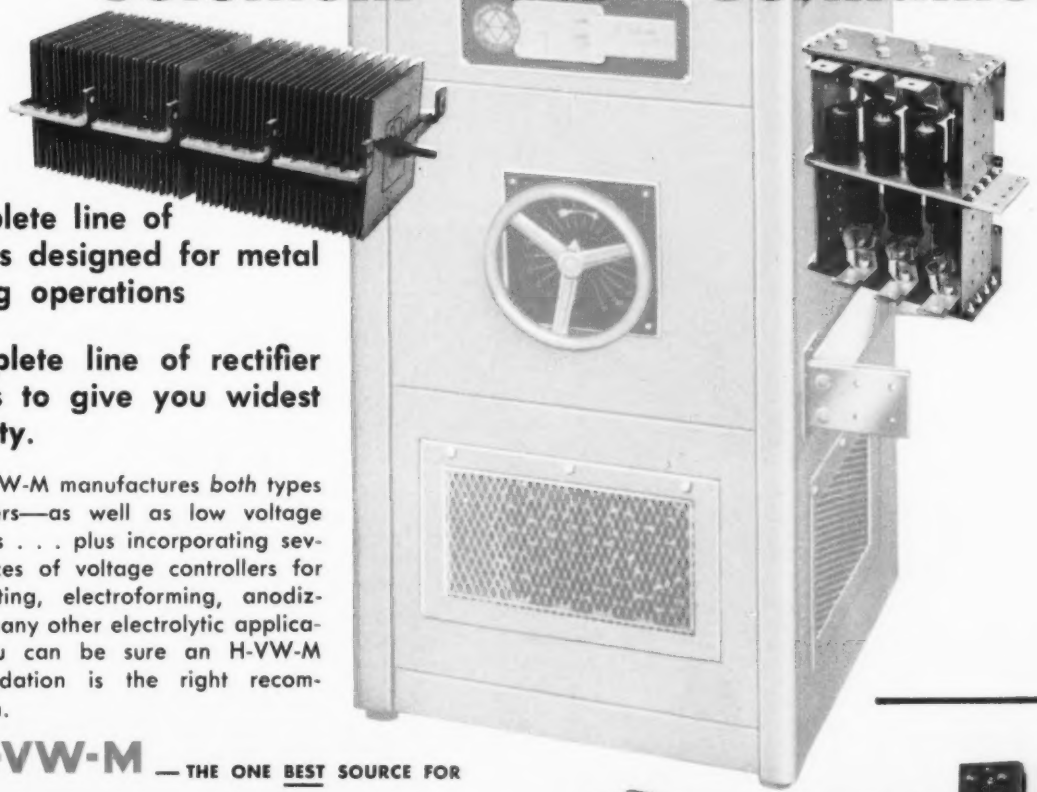
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BULLETIN ER-108

Rectifiers?

you'll find all the answers at H-VW-M

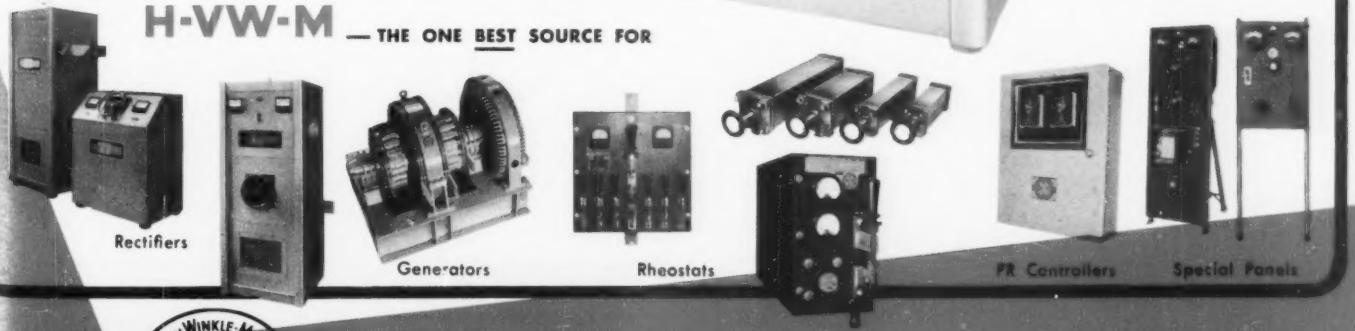


Selenium and Germanium

- **a complete line of rectifiers designed for metal finishing operations**
- **a complete line of rectifier controls to give you widest flexibility.**

Since H-VW-M manufactures *both* types of rectifiers—as well as low voltage generators . . . plus incorporating several choices of voltage controllers for electroplating, electroforming, anodizing and many other electrolytic applications—you can be sure an H-VW-M recommendation is the right recommendation.

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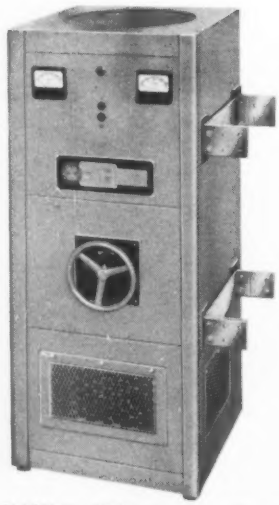
H-VW-M

the answer to every low voltage,

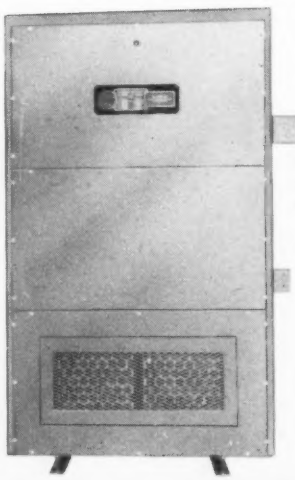
Selecting the right low voltage control equipment to give you proper control in your specific application is a major problem. But this problem is eliminated when you rely on H-VW-M. For H-VW-M produces the world's most complete line of low voltage direct current power equipment. That's why, when H-VW-M engineers make a recommendation you can be cer-

SELENIUM

Highest quality and efficiency, flexibility, economy and low maintenance are the characteristics combined in H-VW-M's full line of self-contained and remote control Selenium Rectifiers. Possessing a high power factor and low ripple, these standard and bench-type rectifiers provide a voltage range of 6 to 48 volts DC.

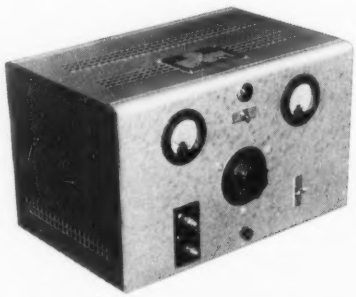


H-VW-M 2500 ampere, 9 volt self-contained rectifier with tap switch control.





H-VW-M remote controlled 5000 ampere, 9 volt rectifier with tap switch control.



H-VW-M small bench rectifier—50 amperes at 6 volts.

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Greater effective selenium plate area per ampere—Individual plates are made of an aluminum alloy, with a layer of highest quality domestic triple-purified selenium.

Electrically balanced selenium plates—Each plate precision-tested to insure *electrically identical plates* in the same stack.

Corrosion-protected stacks—A coating of fungus- and moisture-proof material renders selenium stacks impervious to the corrosive conditions of average plating rooms.

Oversize transformers—Designed for continuous duty at KVA ratings of about 50% greater than the DC output KW.

Adaptability—Auto-transformer can be used for both 220 and 440 volt input, and is protected with coating of moisture- and corrosion-proof material.

Transformer compensating taps for stack aging—Also compensate for small variations in input voltage.

Complete overcurrent and undervoltage protection—Magnetic starter with 110 volt control circuit provides extra safety. Precision-calibrated thermostats over stacks cut out starter when temperature of stacks due to overload rises above safe limits.

High cooling capacity—Large plate area per ampere, plus powerful forced air cooling system, permits continuous operation with minimum heat rise—lengthens life of selenium stacks.

Ask for Bulletin ER-107

RECTIFIERS-

high current rectification problem.

tain their recommendation is unbiased and in your best interest So when it comes time to select power equipment, call your nearest H-VW-M technical representative. He'll help you specify the right unit and type of control for maximum efficiency and economy in your plant.

GERMANIUM

Hanson-Van Winkle-Munning's new low voltage self-contained and remote control germanium rectifiers are specifically designed for the electroplating industry. The germanium junction, with its efficiency and economy of operation, compactness and vast improvement in voltage regulation, opens a new and wider field for metallic rectifiers in the plating industry.

Outstanding efficiency —At full load, with output voltages of 15 volts and above, the germanium rectifier is capable of efficiencies in excess of 90%. Even at lower voltages, efficiencies are exceptionally high.

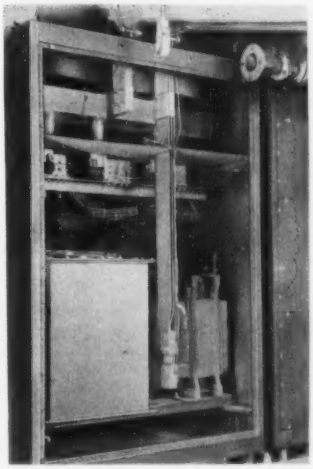
Improved voltage regulation—From no load to full load, voltage regulation of 8% or better can be maintained—no need for expensive automatic voltage stabilization devices in most cases.

Forced air cooling—Air is drawn up through the equipment, across junctions, out through the fan at the top.

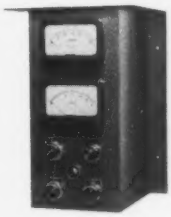
Electrical protection—Overload and DC line shorts guarded against by inexpensive, replaceable link-type fuses. Overcurrent relay in DC circuit can provide additional protection when desired.

Designed for continuous 24-hour-a-day operation—At full capacity. Voltage range is from 6 to 48 volts, with current output from 1000 to 10,000 amps. Higher ratings are available for special applications.

Sturdy cabinet housing—All component parts located within housing. H-VW-M Germanium Rectifiers—though they require little maintenance—are easy to service.



Rear view, with panel open of a 3000 ampere, 15 volt germanium rectifier.



Remote control box with meters and start-stop and raise-lower buttons—for use with H-VW-M Rectifier incorporating motor-driven variable auto-transformer control.

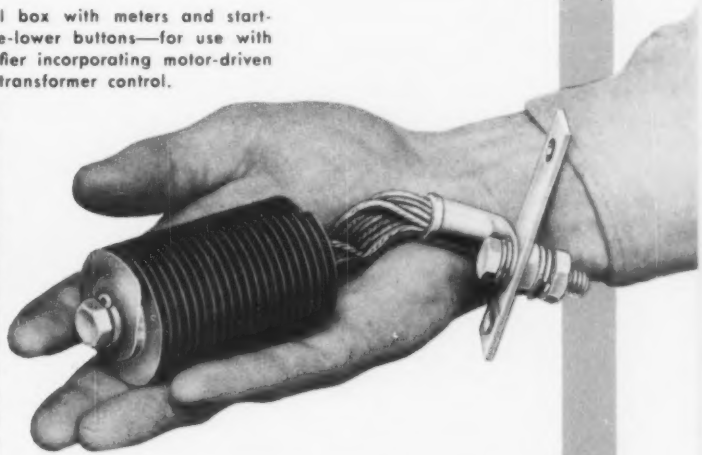


Illustration of a compact germanium junction, the core of new unit.

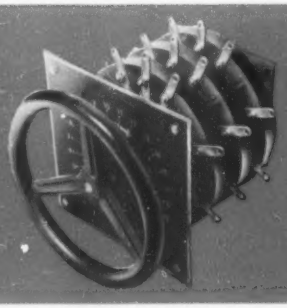
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SEE NEXT PAGE FOR CONTROL FLEXIBILITY AND SUGGESTED APPLICATIONS

CONTROLS *for both*

Selenium and Germanium RECTIFIERS

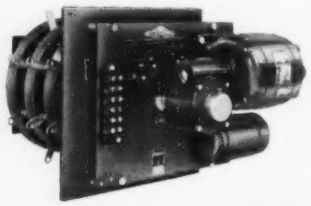
Selecting the proper control is of utmost importance for the most efficient, flexible and economical operation of your rectifier. H-VW-M offers the widest possible selection of controls and control combinations to meet every requirement. Some application suggestions are listed below. Ask for further recommendations from your H-VW-M representative—you can be confident that you'll get top performance from your electrical equipment.



Manual Tap Switch Control

For both self-contained and remote controlled units. Remote control type incorporates tapped auto-transformer in control cubicle. In self-contained units these are located in basic cubicle. Provides 22 positions of voltage adjustment from zero to rated voltage.

Motor Operated Tap Switch Control

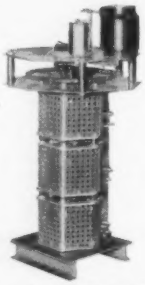


For simple pushbutton control of output from remote location. Used in conjunction with tapped auto-transformer. A small remote control box can be mounted on side of tank or other convenient place. Meters, pilot light, raise-lower and start-stop pushbuttons also on small remote cubicle.

Continuously Variable Auto-Transformer

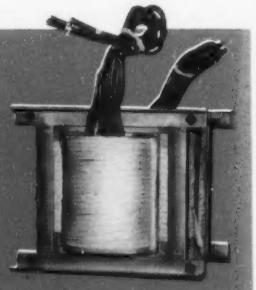
Either manual for small rectifiers or oil immersed, motor driven for larger ratings. This is the best method of voltage control since full stepless control of output voltage can be obtained from zero to rated voltage. It also achieves highest efficiency.

A raise-lower pushbutton as on motor operated tap switch control provides control.



Saturable Core Reactor

Wholly electrical in operation with no moving parts gives smooth voltage control from 10% to 100% of rated voltage providing minimum of 10% current load is drawn. Rheostat mounted on small remote control cubicle providing manual adjustment.



Automatic Voltage Stabilization

Where close regulation of DC voltage is desired to compensate for wide load changes in tank without adjusting voltage manually, a special device will automatically maintain voltage at pre-set amount. Either a voltage sensing panel in conjunction with a motor driven, oil immersed, continuously variable auto-transformer is used, or a special magnetic amplifier in connection with a saturable core reactor. Automatic constant current can also be provided.

Automatic Programming

Where different voltages are desired for special plating applications, an automatic programmer using a system of timers and controls will set the output at one voltage; operate at that voltage for pre-set time; change to another voltage at a pre-set rate; operate at new voltage for a certain time and then shut the rectifier off. There are also more simplified versions. Method of control is motor-operated continuously variable auto-transformer.

APPLICATION SUGGESTIONS

Use	Recommended Control
Batch Tank Plating	Manual tap switch.
Batch Tank Plating with wide load variations and high production	Motor operated variable auto-transformer. or motor operated tap switch.
Barrel Plating	Manual tap switch. No control rectifier.
Cleaning & Pickling	Manual tap switch. No control rectifier.
Conveyor—many stations	Manual tap switch (remote control). Motor operated tap switch. Saturable core reactor. Motor operated continuously variable auto-transformer.
Conveyor—few stations	Automatic voltage stabilization with variable auto-transformer. Automatic voltage stabilization with saturable core reactor.

Use	Recommended Control
Chrome Strike in combination with Plate Sulphuric Anodizing	Automatic programming with variable auto-transformer or special series hook-up. Manual tap switch. Motor operated tap switch. Saturable core reactor.
Color Anodizing	Automatic constant current with variable auto-transformer. Automatic constant current with magnetic amplifier and saturable core reactor.
Chromic Anodizing	Automatic programming with variable auto-transformer. Combination automatic constant current and automatic voltage stabilization with variable auto-transformer or saturable core reactor.
Electrolytic Metal Refining	Automatic current control with saturable core reactor.

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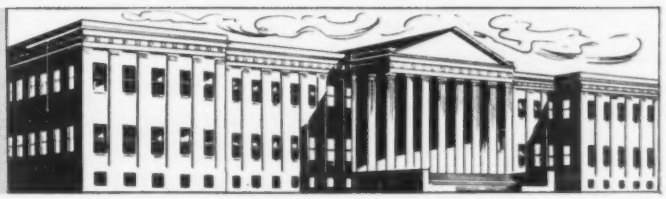
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Patents

RECENTLY GRANTED PATENTS IN THE METAL FINISHING FIELD



Dust Collector

U. S. Patent 2,711,061. *June* 21, 1955. *A. F. Fegert, assignor to Gallagher-Kaiser Corp.*

A dust collector unit for attachment to a device of the type having a stationary structure as well as a driven shaft rotatably supported in the structure and in which the shaft carries a tool for removing material from a workpiece, including a hollow housing having an opening in one end thereof adapted to encompass a portion of the device tool and be supported on the device stationary structure, means connected with said hollow housing and connectible to the device stationary structure for supporting the hollow housing thereon, a portion of one same, being hinged to said hollow housing so as to be wall of said hollow housing, adjacent one end of the swingable between a closed position and an open position wherein a tool can be removed from its shaft without removing the housing, the opposite wall of said hollow housing having a slot extending inwardly from the end thereof to permit said hollow housing to be inserted over the device shaft, exhaust blower means connected with said hollow housing and communicating with the interior thereof adapted to withdraw material removed from a workpiece through said hollow housing, said exhaust blower means including a shaft rotatably supported in said hollow housing, fan blades connected with said shaft, dust-arresting means connected with said exhaust blower means to receive and retain material drawn through said hollow housing by said blower means, a pulley on said exhaust fan shaft exteriorly of said hollow housing, a second pulley disposed in alignment with said first pulley and connectible to the shaft of the device, endless beltlike means extending around said pulleys so that rotation of the device shaft will drive the fan shaft, a belt guard device encompassing said pulleys and belt, and means providing ways on said hollow housing, said way means engaging said guard to releasably retain the same in a desired position but permitting said guard to be slid onto and off of said hollow housing.

Vapor-phase Corrosion Inhbitors

U. S. Patent 2,711,360. *June* 21, 1955. *A. Wachter and T. Skei, assignors to Shell Development Co.*

A corrosion-inhibiting composition of matter comprising a non-aromatic hydrocarbon ammonium nitrite salt having a vapor pressure of at least about 0.0001 mm. Hg at 21°C. and a carboxylic acid salt of an amine, said carboxylic acid being a hydrocarbon carboxylic acid having between one and two carboxyl radicals, containing less than 19 carbon atoms per molecule and having a dissociation constant between about 10^{-3} and about 10^{-8}, said amine containing not more than about 25 carbon atoms, the weight ratio of said nitrite salt to said carboxylic acid salt being between about 20 and about 0.3.

Plating on Zirconium

U. S. Patent 2,711,389. *June* 21, 1955. *J. G. Beach, W. C. Schickner and C. L. Faust, assignors to the United States of America.*

A zirconium material etchant comprising an aqueous solution containing 0.44 to 1.32 moles per liter ammonium fluoride and 0.44 to 0.88 moles per liter hydrofluoric acid, the ammonium fluoride to hydrofluoric acid ratio lying between 1 and 3, inclusive, and 0.25 to 1 per cent of an aliphatic amine having formula

$$C_nH_{2n+1}NH_2$$

where n lies between 12 and 18, inclusive.

Buff and Core

U. S. Patent 2,711,619. *June* 28, 1955. *J. R. Davies.*

A circular buffing unit comprising a plurality of sheets of flexible buffing material having two opposite edges in registering relationship with each other, pleats in each sheet along one of its registering edges so as to create an arcuate shaped buffing unit, successive reverse folds in the inside edge of the buff unit as a whole so as to produce a parallel sinuous configuration in all the sheets of the material and to draw the material into a circular unit, and means lying in a plane normal to the axis of the buffing unit and passing through said folds at right angles thereto for holding them in said sinuous position.

Protective Coating

U. S. Patent 2,711,974. *June* 28, 1955. *A. H. Happe, assignor to Herman A. Sperlich.*

The process of coating metals which consists in applying thereto a thin layer of an intimate mixture of 1.290 sp. gr. water solution of sodium silicate having a

high sodium content	50% by weight
Cobalt oxide	15% by weight
Nickel oxide	15% by weight
Exfoliated vermiculite	10% by weight
Kaolin	10% by weight

and heating to a temperature of at least 750-800°F.

Vitreous Enamel

U. S. Patent 2,711,975. *June* 28, 1955. *E. Wainer and R. A. Kempe, assignors to Thompson Products, Inc.*

A coated metal article comprising a base composed principally of molybdenum, and a corrosion resistant coating about said base consisting essentially of a vitrified mixture containing 10 to 30% calcium oxide, 10 to 30% aluminum oxide, 40 to 70% silicon dioxide, 1 to 10% boric acid, and 5 to 30% zirconium oxide, the thickness of said coating being on the order of .002 to .005 inch.

Oil Removal from Tanks

U. S. Patent 2,711,978. *June* 28, 1955. *R. W. Groom.*

A method of cleansing the interior surfaces of tanks by the substantial



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removal of oily deposits from such surfaces, such method comprising introducing at least one nozzle into the tank; heating and supplying to the said nozzle an aqueous detergent liquid of suitable concentration under such pressure that said liquid is projected against and cleans the said surfaces; collecting the mixture of aqueous detergent liquid and removed oily deposits; withdrawing said mixture from said tank; separating, by gravity separation, from such mixture the aqueous detergent liquid, the oil (which floats on the surface of the aqueous detergent liquid) and the sludge (which sinks in such liquid); withdrawing the said oil for reclamation, withdrawing the said sludge separately of said oil; reheating said separated aqueous detergent liquid and recirculating it to said nozzle for further use.

Conveyor for Cylinders

U. S. Patent 2,711,993. *June* 28, 1955. *G. A. Lyon.*

In an apparatus for conveying a cylindrical article through a liquid processing bath, a pair of parallel substantially horizontal conveyor tracks extending along the length of said bath, a conveyor frame movable along said tracks, means for driving said frame therealong, a pair of conveyor carriages mounted on said frame for movement therewith and extending laterally therebeyond, said carriages each having a depending resilient leg terminating in an outwardly projecting extension adapted to be submerged within said bath and to be moved through said bath by the associated carriage, spaced rollers carried by said extension for rotation on axes generally parallel to said extension; said extension and said rollers being adapted to receive said article thereover in telescopic relation, an additional roller carried by said depending leg for contacting an exterior surface of said article, and a depending electrode contact member disposed above the path of movement of said extension through said bath to provide a lower camming surface adapted to contact an exterior surface of said article to tension said depending resilient arm and to retain said extension and said article submerged within said bath.

Production of Lined Bearings

U. S. Patent 2,712,166. *July* 5, 1955. *J. B. Mohler, assignor to Johnson Bronze Co.*

The method of making bronze backed, cast babbitt lined bearings, which comprises electrodepositing a thin barrier layer of metal of the group consisting of nickel, cobalt and iron on a bronze backing, and casting molten lead base, tin-containing Babbitt metal on said barrier layer to form a bearing lining.

Electropolishing of Gold and Gold Alloys

U. S. Patent 2,712,524. *July* 5, 1955. *M. Reichert, assignor to Deutsche Gold- und Silber-Scheideanstalt vormals Roessler.*

A process for polishing surfaces of gold and gold alloys of a fineness of at least 8 carats which comprises anodically electropolishing such surfaces in an aqueous electrolytic bath essentially consisting of water, a minor proportion of at least one acid to acidify said bath and at least 5 grams of thiourea per liter at a temperature up to 100°C. and at current densities which cause the formation of a film upon the surfaces treated.

Electropolishing of Gold Alloys

U. S. Patent 2,712,525. *July* 5, 1955. *J. Fischer, assignor to Deutsche Gold- und Silber-Scheideanstalt vormals Roessler.*

A process for polishing the surfaces of gold alloys of a fineness of at least 8 carats which comprises anodically electropolishing such surfaces in an aqueous acidic bath containing at

least 5 g. of thiourea per liter and to which 0.03 to 0.3 mols of a salt furnishing ions containing at least one of the metals contained in the gold alloy to be polished which is less noble than gold has been added from an external source, at a current density causing the formation of a film upon the surfaces treated.

Vapor Degreasing Apparatus and Method

U. S. Patent 2,714,079. *July* 26, 1955. *F. M. Stodgell.*

Apparatus for cleaning the interior surfaces of an open-ended elongate object, said apparatus comprising a boiler for containing a liquid solvent, means for heating the boiler to vaporize said solvent, a vapor conduit extending from said boiler into one of said object's open ends for directly introducing vapor into and progressing it through the object by boiler pressure, and thermostatic means operable in response to vapor heat in said object for controlling said boiler pressure sufficiently to arrest said vapor progress short of said object's other open end.

Method and Apparatus for Cleaning Metal Strips

U. S. Patent 2,713,011. *July* 12, 1955. *G. Durst, assignor to Metals and Controls Corp.*

Apparatus for cleaning the inwardly opposed faces of two strips travelling in spaced face-to-face relation, comprising means defining a chamber having a strip inlet and a strip outlet end, said means having an opening in one side to the chamber, a removable closure for the side opening, a pipe carried by and removable with the closure for the side opening, a pipe carried by and removable with the closure extending across the chamber in position for the two strips to travel on opposite sides thereof, said pipe having a free end formed for ready insertion between the strips and having gas outlet apertures directed toward the inlet end of the chamber adapted to emit a blast of gas directed toward the inlet end of the chamber to blast the entire width of the inwardly opposed faces of both strips to sweep dust therefrom, the gas emitted from the blast device flowing between the strips in the direction opposite to that of travel of the strips toward and out of the inlet end of the chamber to avoid redeposition of dust on the strips.



Electrodepositing Iron

U. S. Patent 2,714,089. *July* 26, 1955. *W. R. Meyer, assignor to Enthone, Inc.*

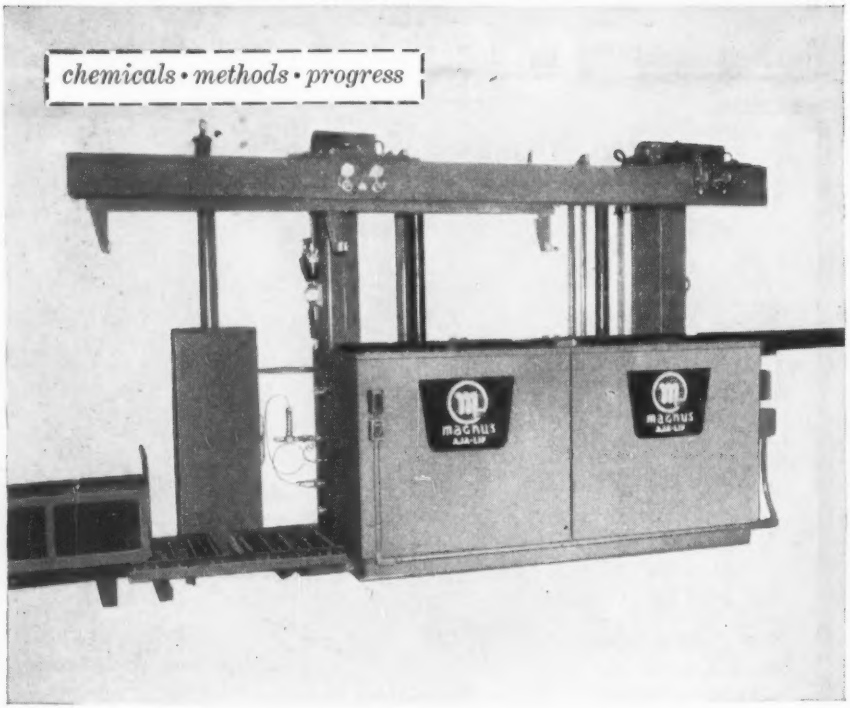
The process of electroplating iron onto an article which includes the step of preparing a bath containing water, from 0.5 to 5 molar alkali hydroxide, from 0.5 to 5 molar organic amine, from 0.02 to 0.5 molar ferric compound, and a salt of ethylenediaminetetraacetic acid in a molar ratio relative to the iron of from 0.5 to 1.5, the solution having a pH greater than 11, making the article to be coated a cathode in an electroplating cell, and passing an electric current through the cell at a current density of from 3 to 300 amperes per square foot of cathode surface.

Electrodeposited Coatings

U. S. Patent 2,714,088. *July* 26, 1955. *W. P. Karash, assignor to The Harshaw Chemical Co.*

A process of producing a bright, electrodeposited coating wherein chromium is applied subsequent to antimony comprising electrodepositing on a bright antimony metal surface a film of a metal of the class consisting of nickel, cobalt, zinc, iron, white brass and copper of a thickness, from 0.000002 to 0.0001 of an inch and electrodepositing a layer of chromium over said film, said bright antimony metal surface being the surface of an electrodeposit of antimony on and firmly adherent to a metallic base.

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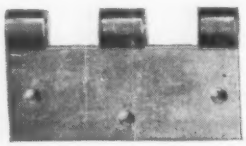
Thoroughly Cleans Batches of Metal Parts *Automatically*

Since the first automatic cleaning machine featuring the Magnus Method of mechanical agitation was designed and built, industry has been quick to adopt this new cleaning method. It has proven itself in the production lines of many well-known manufacturing plants.

In the above Magnus Aja-Lif Automatic, a 2-stage wash and rinse machine, baskets of parts are automatically loaded and carried through the tanks where they are vigorously agitated in the cleaning and rinsing solutions for a pre-determined length of time. Additional stages can be added for any number of subsequent operations. Solvents, alkaline or acid solutions can be used.



Hinge sections before and after cleaning in Magnus Aja-Lif Automatic.



This is only one type of a complete line of Magnus mechanically agitated cleaning machines. Before you decide on *any* kind of production cleaning setup, let us show you what the Magnus Method has accomplished for others and can do for you. Ask for your copy of Bulletin 10,000 G. Magnus Chemical Co., Inc., 11 South Avenue, Garwood, N. J.

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Industrial Cleaning Division

MAGNUS CHEMICAL CO., INC.

Plated Bearings

U. S. Patent 2,715,259. *Aug.* 16, 1955. *J. B. Mohler, assignor to Johnson Bronze Co.*

A bearing comprising a steel back, a layer of aluminum base bearing alloy bonded to the steel back, a layer of electrodeposited copper having a thickness of 0.1-0.5 mil bonded to the aluminum alloy bearing layer, and a layer of electrodeposited tin base bearing material having a thickness of 0.2-2.0 mils bonded to the copper layer.

ABSTRACTS

Transparent Protective Lacquers for Plated Metals

By Dr. Reichnow

The author first differentiated between the nitrocellulose, synthetic resin and chlorinated rubber transparent lacquer finishes used for this purpose. With the synthetic resin finishes, these can be sub-divided into the drying oil-containing and oil-free lacquers. The third group of the chlorinated rubber lacquer finishes possesses a very good acid resistance. It finds particular use for the insulation of hanging racks etc.

As compared with former practice, the application techniques have completely changed. Today, application is rarely made by hand. Electrostatic spraying treatment has made great advances. Dipping machines are also used extensively for large sized parts. The dipping time must be so arranged that the process is ended within 5-10 seconds. Sheets are most frequently handled by roll coating machines.

Drying is conducted in ovens with forced air circulation. Infra-red drying is also used to a considerable extent. The present day trend here is to pass over more and more to the dark emitters in place of the bright radiant emitters formerly used. Even with dark infra-red emitters, it is still preferable to use forced air circulation in the drying chambers to avoid all danger of burning the lacquer.

One of the largest fields of application for these transparent protective lacquers is in the packaging industries. These packaging lacquers

ensure the safe despatch of sensitive materials. These lacquers also have a most useful purpose and extended field of application for decorative purposes. Thus, for example, by baking a very fine lacquer, gilding of aluminum can be achieved. The characteristics of the protective lacquers have today been so highly developed that a suitable lacquer is available for practically every purpose. Mention was made in this discussion of the insufficient alkali-resistance of various protective lacquers of this type. Fairly good resistant lacquers are available for this purpose, but the alkali resistance of a finish is always considerably lower than the acid resistance.

Influence of Hydrogen in Plating Processes

By Prof. E. Raub

The author discussed the results which had been obtained from the investigation of hydrogen evolution in nickel plating baths. These results showed that the supply of atomic hydrogen to the cathode film is dependent on the electrolysis conditions. If, for example, the temperature is increased, then the hydrogen adsorption is reduced. Changes in the pH value cause strong changes in the hydrogen adsorption. If the hydrogen ion concentration is increased in a nickel bath then, at first, the hardness of the nickel deposit decreases up to a certain pH value. If the pH value is reduced still further, then the hardness gradually increases and this can be ascribed to a stronger co-deposition of the hydrogen. The investigations extended over the influence of bath movement and base metal.

The very complex relations were shown in a striking manner, Thus, for example, it was shown that the co-deposted hydrogen, in many respects, behaves in quite a similar manner to a metal. With metals, research has shown that a considerably greater amount of alloying constituents are absorbed in a finely dispersed form by the base lattice than is thermodynamically possible. This also holds true for hydrogen. Proof of the occluded hydrogen with the aid of X-ray investigation is, unfortunately, not possible. There is found, however, strong effects on the hardness, internal stresses, and other characteristics of the deposits.

In pickling and cleaning, the ad-



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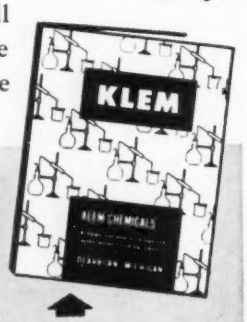
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sorption of hydrogen results in embrittlement. The influence of the alloying composition of the base metal in this connection, is particularly great. Soft steel for example, tends much less to hydrogen adsorption than does high carbon steel. Certain alloys tend so strongly to hydrogen adsorption that even very short times in the electrolytic cleaning bath are sufficient to adversely affect the adhesion of subsequently applied plated coatings. It was indicated in this connection, that the hydrogen adsorption is a time-dependent function. This fact renders understandable why, for example, spring steel with a copper deposit becomes strongly embrittled in a bath with a high CN : Cu ratio, while in another electrolyte in which this ratio is low (as for example, in the modern, high metal-content baths) the embrittlement can be maintained within permissible limits.

The author dealt finally with the inhibiting action of the hydrogen which is shown very clearly in the case of bright zinc deposits. It is only when the limiting current density is exceeded and hydrogen co-deposits to a greater extent, that bright deposoits are obtained.

Corrosion of Electroplated Deposits

By Prof. E. Raub

In this paper the author dealt in a fundamental manner with the corrosion of electrodeposits. Two cases were distinguished and these are:

1. Corrosion phenomena in which only the coating metal takes part and
2. True galvanic corrosion, in which the coating and the ground metal mutually act together.

The requirements for the course of the corrosion in case 2 is the presence of an electrolyte of sufficient conductivity. It is not quite sufficient that the coating and the base metal differ from one another in potential. The corrosion resistance is mostly determined by the pore resistance, i.e. by the number and size of the pores present. The thicker the coating metal is deposited, in general, the greater is the pore resistance and the smaller is the corrosion velocity.

The formation of surface coatings is often of decisive importance, if the dissolved metal forms difficultly soluble deposits with the corrosion medium present. Complex cation formation also belongs to this category. Finally, inhibitors also influence the corrosion velocity to a considerable extent.

Some fundamental conclusions can be drawn regarding the cathodic and anodic processes and, in this connection, special significance attaches to the hydrogen overvoltage.

It was emphasized by the author that insufficient cleaning or rinsing often gives rise to corrosion. If residues from the cleaning bath adhere to the metal, these become occluded in the subsequent deposit, which subsequently leads to eruptions, particularly if the objects are given a hot rinse for the final cleaning. At such "spotting-out" places of this nature, one can often establish, by means of microscopic testing, inclusions from the crystallized-out bath.

Special Pickling Procedures for Steel and Special Alloy Semi-Products, Based on Electropolishing Techniques

Bulletin Technique (Belgium), No. 21 — 1954 — pp. 26-27.

In the majority of cases with steel semi-products such as billets, bars, rods etc., these products are subjected to an operation of grinding or turning, before being rolled. This machining has two objects; first to remove the oxide coatings arising from the forging or rolling operations of the ingot and

then, to exercise control by localized grinding or machining. The disadvantages of this technique are:

1. An appreciable loss of metal which, in the case of alloy steel, is relatively costly.

2. An imperfect detection of certain faults and defects, which are masked by the machine tool mounting;

3. The introduction of fresh surface defects, showing up at later stages and caused by the violent action of the tool;

In the majority of cases it is possible to substitute, for the machine tooling operations outlined above, an electrolytic descaling treatment in baths derived from those utilized in electropolishing processes. Here, the surface condition obtained is much superior to that furnished by mechanical machining methods and the loss of metal is much lower. In addition, the residual defects are better visible and their mechanical removal is easily affected. A fresh passage through the bath in addition, permits of verifying if the defects which have been ground or machined have effectively disappeared.

A further advantage is the fact that these semi-products must again be reheated, prior to rerolling and other working. The kinetics of the surface oxidation which occurs during the course of this reheating is modified favorably in the case of the semi-products which have been descaled electrolytically and the quality is improved. At further stages of working, involving cold-rolling or extrusion, it would also be of advantage to substitute an electrolytic descaling-polishing process for the classical chemical pickling processes which are in universal use, and which are frequently incomplete in their effect and often result in a general corrosion of the metal.

As electropolishing is perfectly adaptable to continuous methods of working, in view of the undoubted advantages, its application to the descaling of hot rolled steel sheet and to rod and bar products should become general practice. The first tests which were conducted on wire rod of carbon steel for drawing down to piano wire, have given excellent results. The control by electropolishing of drawn wire for the manufacture of safety springs has shown a considerable improvement in the state of the final surface.

Steel surfaces which have been polished electrolytically in this manner have interesting surface characteristics; the capacity of plastic deformation is improved in certain cases. Thus pressing, drawing and embossing processes are improved.

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For use under U. S. Patent No. 2,689,216

Testing of Passivation of Zinc and Cadmium Coatings

W. Metzger, *Metallwarenindustrie und Galvanotechnik*, vol. 45, No. 12, p. 604.

A great deal of zinc and cadmium coated ware produced is chemically passivated, the passivating substances containing mainly chromium compounds. Metal chromate coatings are formed on the surface which render the metal more resistant to corrosive influences. Where decorative applications are concerned, solutions can be used by which passivation is achieved and a brilliant surface is simultaneously obtained. Passivated coatings can frequently be detected by the iridescent coatings which are characteristic of the chromate films. Certain color tones are also obtainable, for example yellow brass. Passivation treatments however are also possible, which cannot be detected by eye, particularly where the surface area is small. In such cases the following test solutions can be used to detect any passivation:

An aqueous solution which contains 5 g./l. of copper sulfate. Pure copper sulfate is preferable to the commercial grade. On dipping in this solution, passivated parts remain perfectly clear. Non-passivated parts are immediately attacked and become dark discolored.

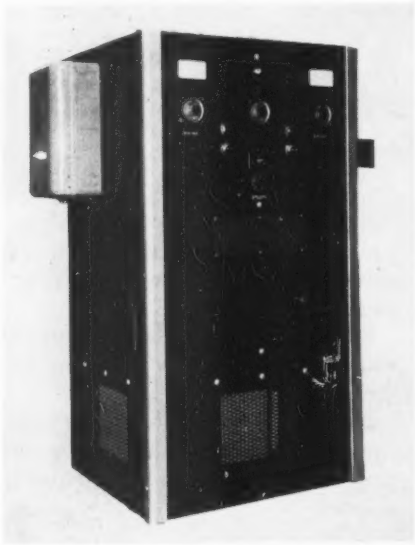
Recent Developments

NEW METHODS, MATERIALS AND EQUIPMENT FOR THE METAL FINISHING INDUSTRIES



Rectifiers with Automatic Programming

Rapid Electric Co., Dept. MF, 2881 Middletown Road, New York 61, N. Y.



Any sequence of plating operations can be made completely automatic through the use of the firm's automatic programming equipment, it is claimed.

Either selenium or germanium power units can be combined with program timing equipment for automatic operation of any series of plating steps.

A number of synchronous timers housed in a single cabinet with interlocking circuits and controls will start, stop, and time any number of separate operations in any sequence without supervision or interruption.

The use of such timers, plus a motor-driven auto-transformer controls the output in pre-set time intervals for complete pre-strip and finishing operations.

Simple application to any existing installation plus the elimination of supervision and manual control are additional features of this equipment.

Conversion Coating for Cadmium

The Chemical Corporation, Dept. MF, Springfield, Mass.

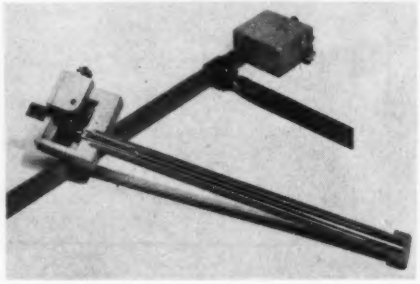
Luster-On NL-C is a chromate conversion coating for cadmium that will produce a bright clear finish with corrosion protection. This process is particularly useful for installations where space is a factor. By using this material, two tanks are eliminated from the cycle that are normally required in a chromate leaching cycle.

Temperature Regulator

Elkart Controls Co., Dept. MF, Route 2, Elkhart, Ind.

A new, highly accurate and low cost temperature regulator for plating baths is claimed to be impervious to plating acid deterioration or "build-up." Called the Eltemp, the unit represents a new-looking and more efficient concept of temperature regulation and produces a greater measure of control over plating solution temperature than has heretofore been available.

The regulator is entirely different in appearance, materials, and design



from any control now on the market. Its entire body is constructed of an acid-proof, temperature-sensitive thermoplastic, Uscolite. Utilizing the expanding and contracting properties of this material, which, itself, is the thermal conducting medium, the unit automatically regulates the operation of heating or cooling sources to a temperature tolerance of within plus or minus one degree in a constant solution level, reducing the chance of boil-overs and resultant loss of valuable plating concentrations.

A more accurate average-depth tank temperature—and thus improved plate quality—is produced by the long thermal tube, which extends deep into the plating solution and compensates for temperature changes wherever they occur, instead of at just one point.

Simply and ruggedly constructed, the regulator needs little maintenance. The unit is guaranteed by the above manufacturer for one year. A companion solenoid valve, specially modified with a stainless steel valve plunger and seat assembly, is also offered for steam or hot water application of the new control.

All Plastic Self Priming Filter Pumps

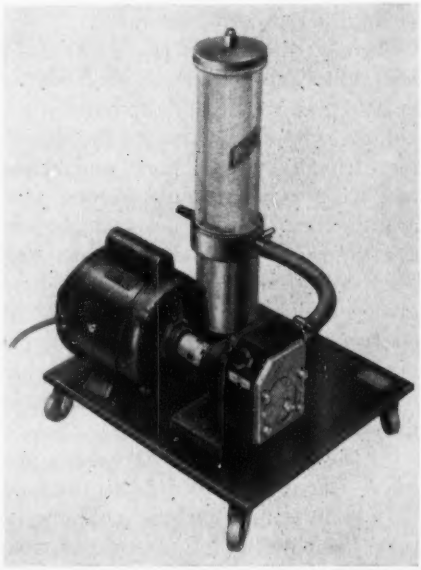
Sethco Mfg. Co., Dept. MF, 70-78 Willoughby St., Brooklyn 1, N. Y.

The new LBNI series consist of a plastic pump and a plastic filter assembly mounted on a linen impregnated phenolic panel and coupled to a totally enclosed, ball bearing ¼ H.P. motor. Portability is obtained by the use of rubber tire, ball bearing casters. Three sizes are now available in this series as per the following table:

Model	*Capacity*
LBNI- 5	50 gph
LBNI-10	100 gph
LBNI-20	200 gph

The choice of materials is such that unlimited filtering applications are possible:

Pump Body: Bakelite, Buna N. Hy-



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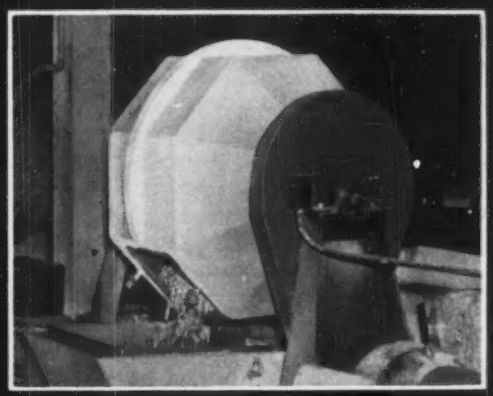
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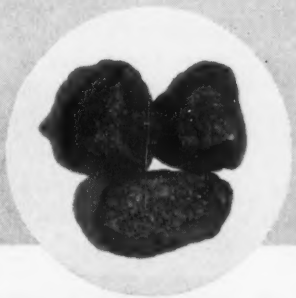
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"The fact that it takes 15 minutes or less to clean our Sel-Rex Filter has helped us increase production appreciably, in our electroforming operation. We spend more time filtering — less time cleaning," says Mr. A. R. Miller, chief chemist, Ideal Toy Company. "Another cost-cutting advantage is the use of unskilled help, thanks to the unique color-coded valves."

Ideal Toy Company is one of many Sel-Rex Filter users who enjoy the fruits of expert filter engineering know-how. If your manufacturing operation entails solids recovery or liquid clarification, it will pay you to investigate Sel-Rex Filters—the fastest cleaning filters on the market.

Sel-Rex Double Duty Filters use either a new stainless steel mesh element or POROUS STONE membrane. The entire element is secured to the tank cover—lifts out freely and easily for cleaning, by hand or with a hand-operated davit mounted on the shell on larger models. Messy handling of wet and dirty elements is eliminated—you can even clean an element used for carbon treatment without soiling your hands.

Standard portable, mobile and stationary models from 250 to 18,000 GPH capacity. Larger models built to specifications. Cut filtering costs — send for technical literature today.

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Pump Impeller: Neoprene, Gum Rubber, Vinyl, Hypalon.

Filter Assembly: H. T. Lucite, Saran, Rigid PVC, Polyethylene, Epoxy, Teflon, etc.

Filter Tubes: Cotton, Dynel, Porous Stone, Porous Carbon.

Cotton and Dynel tubes are available with either a stainless steel or perforated Bakelite supporting core. Filtration is in depth and not a surface operation. The size of the particles to be filtered out can be controlled from 150 microns down to 1 micron by varying the density of the mesh of the cotton or Dynel. Cotton tubes are recommended for filtering most dilute acid and alkaline solutions. Dynel tubes are recommended for the higher concentrated acid and alkaline solutions including oxidizing acids like chromic and nitric.

Porous stone tubes are recommended for all concentrations of acid solutions except the fluoride acids.

Porous carbon tubes are recommended for all concentrations of alkaline solutions, acid solutions and hydrofluoric acid solutions.

Rubberized Abrasives Kit

Cratex Mfg. Co., Dept. MF, 81 Natoma St., San Francisco 5, Cal.

A comprehensive, yet, inexpensive polishing kit contains an assortment of 24 of the most popular Cratex polishing wheels, cones, blocks and mandrels.

The kit contains complete instruction bulletin for efficient application of rubberized abrasives and their "cushioned action performance" in burring, smoothing and polishing on hard or soft metals, plastics, ceramics, glass and other materials. It is sold at industrial supply dealers for $12.50 or may be ordered direct from the above manufacturer.



Buffing Compound Cleaner

Cowles Chemical Co., Dept. MF, 7016 Euclid Ave., Cleveland 3, O.

Lixol, a water-soluble liquid cleaner to remove all types of buffing compound from all ferrous and non-ferrous metals, has just been released for sale and broad patent coverage has been applied for on this product.

The cleaner is mildly alkaline (pH about 9 at working concentrations) but it is neither a conventional alkaline cleaner nor a conventional solvent. It is non-toxic and non-flammable. The product is used in substantially the same set-up employed with an alkaline soak cleaner. Tank make-up calls for two gallons in 98 gallons of water (2% by volume). Working temperature is 170°F. Minimum immersion time is usually three minutes.

When buffing compound removal precedes storage, shipping, or further handling, a conventional spray-rinse after immersion in the cleaner is sufficient to remove loosened sediment from recessed and inaccessible areas.

When the washed parts are to be phosphatized, painted, or similarly finished, the soak is followed with a spray-clean and spray-rinse. Before plating, the soak is followed with a spray-clean, a spray-rinse and a light reverse-current electrocleaning operation.

The cleaner was researched, developed, and field-tested primarily to remove impacted deposits of buffing

compound from zinc base die castings without harm to the metal. It works equally effectively, however, on aluminum, brass, copper, and steel. It will therefore be promoted for removal of buffing compounds from all metals.

Barrel Plating Equipment

G. S. Equipment Co., Dept. MF, 5319 St. Clair, Cleveland, O.

Unique cost-saving and performance improving developments from end-to-end are claimed for the completely new plating "line" equipment introduced by the above manufacturer.

An exclusive, patented, dual V-belt suspension-drive eliminates costly transmission gears and cylinder bearings, subject to wear and corrosion damage in solutions—biggest maintenance factor. Neoprene V-belts support each cylinder and load while transmitting power, and permits complete cylinder load immersion.

Entirely different superstructure design features two, 12" long, self-cleansing, inverted V-block cathode contacts, providing 16" more contact area than the next longest in the industry, and carrying up to 30% greater current flow per load. For faster, smoother operation, a guide channel directs superstructure into position on tank, seating inverted V-blocks on round, cathode rods on tank rim.

Danglers are directed at a downward angle through floating H-T Sincolite hubs. Danglers won't "ride" up on load. Usual maintenance problems of dismantling and assembling are solved by new principle of self-locking U-plates of "H-T Sincolite" fitted over the cylinder hubs. The assembly is unlocked by simply sliding out the U-plates. Only 4 minutes are needed for cylinder interchange, and just ½ minute for cleaning and replacing danglers, all without special tools.

Cylinders are "H-T Sincolite," heavy-ribbed, fusion-welded construction, offering rugged durability, and long life for complete plating cycles at temperatures up to 200°F. Absence of any "formed" sections avoids all danger of warpage or cracks due to "plastic memory" stresses. All parts are interchangeable.



Recently developed, semi-automatic barrel loader at front-end of line is all-welded in sizes to fit all cylinders. Receiving end of chute is flush with floor level for easy loading, and tilts automatically as it is hoist-lifted, discharging full load into cylinder supported in rack. Features exclusive plastisol coated lip for preventing injury to cylinders.

At finish-end are the centrifugal driers; dual units fed by a dividing chute in which the discharged cylinder load is separated and fed into the 2 metal drying baskets which spin in preheated units.

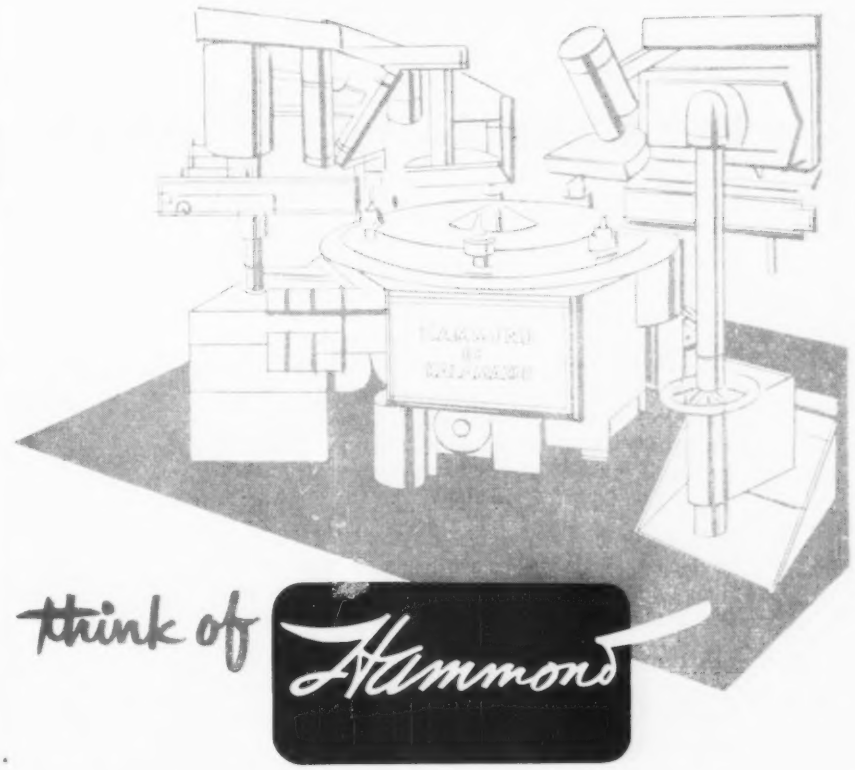
Emulsion Cleaner

Kelite Corp., Dept. MF, 1250 N. Main St., Los Angeles 12, Cal.

Ke-Sonic is an emulsion cleaner for the removal of oily soil and greases, manufactured under U. S. Patents No. 2,381,124 and No. 2,485,554 (other patents pending). It is claimed to be exceptionally desirable for marine use because removed soil is held in stabilized emulsion even when mixed with sea water.

One form known as Ke-Sonic-C is employed by diluting with kerosene, diesel fuel or No. 2 fuel oil, and the

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In our work with Electroplaters we generally find that they are reconciled to wastage — until they learn they may be losing $60,000 or more of every $100,000 paid for gold. Exorbitant waste is often due to outmoded equipment and inefficient electroplating methods and solutions. We correct these conditions so effectively that your cost can drop to a record low figure — while you increase efficiency and achieve predetermined standards of deposition that can be repeated indefinitely.

With Technic aqueous gold solutions and Technic-engineered installations we bring existing operations under scientific control, and we initiate new operations custom-engineered to do the job right.

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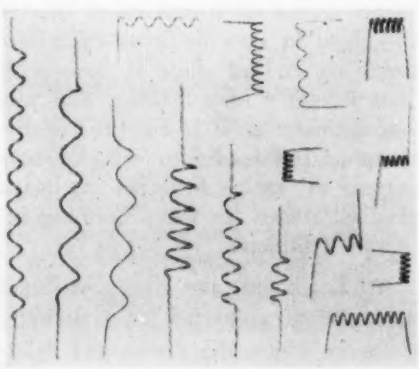
soiled parts then sprayed, brushed, wiped or immersed in the solution. It is corrosion safe on all structural metals, and is unique among emulsion cleaners in that it will clean metal to provide a no-water break rinse.

Ke-Sonic may be diluted with up to 20 parts of water and used in industrial pressure washing machines for the removal of oily soil from metal parts. Both materials are fire safe. They exhibit a Cleveland open cup flash point of 180°F. and a Cleveland open cup fire point of 220°F.

Tungsten Filaments

Micro-Wire Stranding Co., Tungsten Div., Dept. MF, 131 Park Place, Passaic, N. J.

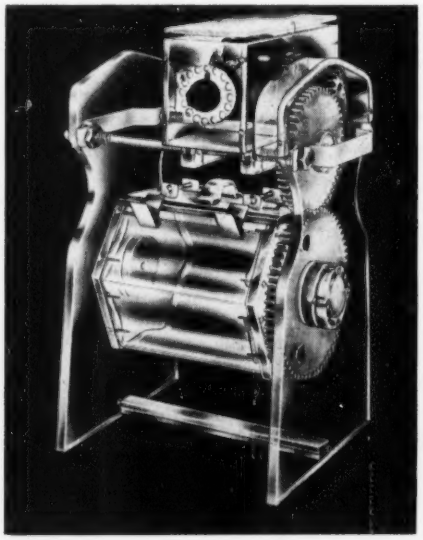
For use in vacuum metallizing chambers, the above manufacturer is producing single strand and stranded tungsten filaments designed to give more effective flashes, maximum evaporating capacity with a uniform flow of metal, and longer life with minimum breakage.



These sturdily built filaments, designed for specific metallizing jobs, are made from 99.95% pure tungsten. Chemically clean surfaces are free from cracks, grooves, lubricants, oxides, foreign substances or other irregularities. Reel wound, cut lengths, or uniform finished coils. Micro-Wire filaments are produced in single strand or stranded cable from 0.0005" to 0.250."

Portable Burnishing Barrel

Hanson-Van Winkle-Munning Co., Dept. MF, Matawan, N. J.



The advanced design of a new portable type Mercil burnishing barrel makes it readily adaptable to light weight work such as jewelry polishing and the deburring and cutting down of other types of material.

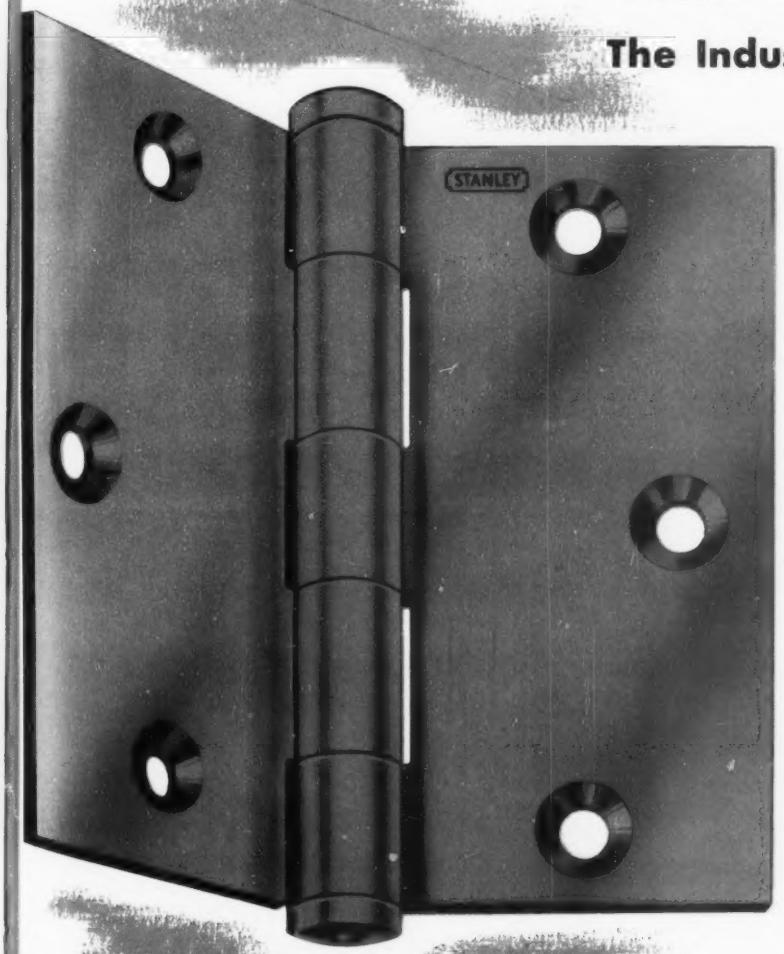
The barrel is light because in its entirety it is made of Plexiglas. Its compact size, 8" in diameter and 8" in length, and its light weight allow it to be easily carried from place to place. Rotating in ball bearing bushings, the new type barrel is powered by a 1/18 horse power, 5,000 rpm., 115 volt motor. The speed is controlled by a rheostat which permits variable settings up to 60 rpm. when loaded.

The work load is determined by the size of the pieces to be processed. The barrel can handle 5 to 10 pounds of work and 20 to 25 pounds of balls. A loading hopper and unloading stand are available as accessories. The new burnisher has a rubber gasket cover retained by spring clamps to insure a tight fit.

Further information may be obtained by writing directly to the above manufacturer.

STANLEY **NO. 241 HINGES**
"Standard of the World"

finished with LEA LIQUABRADE



The Industry Standard for liquid buffing and polishing compositions

Occasionally a product becomes the "standard" of its type because of unvarying excellence in manufacture and use. Such a product is the Stanley No. 241 Hinge. Almost since it was first introduced in 1879, this has been the *Standard of the World* for plain bearing hinges.

For the finishing of the No. 241 Hinge, and many of its other products, The Stanley Works uses LEA LIQUABRADE . . . the Finishing Industry Standard for a stable, non-settling, non-flammable liquid buffing and polishing composition.

For *flexible, high production rate, low cost* finishing line operations you can't beat the Lea Spray Buffing Package Plan — Lea Liquabrade and Lea Engineered Spray Buffing Equipment. Write today for complete information.

Burring, Buffing, Polishing, Lapping, Plating and Spray Finishing . . . Manufacturers and Specialists in the Development of Production Methods, Equipment and Compositions. Manufacturers of Lea Compound and Learok . . . Industry's quality buffing and polishing compounds for over 30 years.

THE LEA MANUFACTURING CO.
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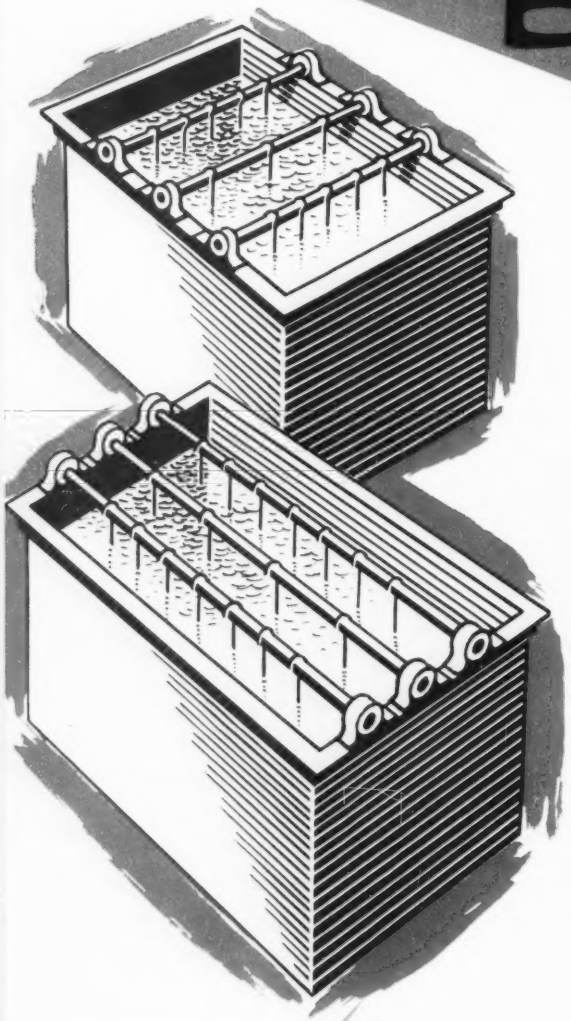
Lea-Michigan, Inc., 14066 Stansbury Ave., Detroit 27, Mich.
Lea Mfg. Company of Canada, Ltd., 1236 Birchmount Road, Scarborough, Ontario, Canada
Lea Mfg. Company of England, Ltd., Buxton, England
Lea-Ronal, Inc., Main Office and Laboratory: 139-20 109th Ave., Jamaica 35, N. Y.
Manufacturing Plant: 237 East Aurora St., Waterbury 20, Conn.

Are you interested in Plating Specialties? **SEE THE OTHER SIDE OF THIS INSERT.** ➡

Lea-Ronal announces

BRASS-GLO*

FOR HIGH SPEED LUSTROUS BRASS PLATING



Lea-Ronal's Research Group has done it again — developed another process to help reduce your plating costs while producing better products!

Lea-Ronal High Speed Brass will produce a uniform lustrous brass color over a wide current density range (5-100 amp/sq. ft. Hull Cell). In still tank production, results show that you will obtain a cathode efficiency of 95% or over with a range of 5 to 25 amp/sq. ft. in addition to high luster. An example of the very rapid rate of deposition is that at 25 amp/sq. ft. for 5 minutes the deposit will be 0.0002" thick.

Do you want lower operating costs and increased production? This Lea-Ronal High Speed Brass Process using Brass-Glo has been providing those advantages to its users for over a year. It's well-proved. One tank will do the work of five with a conventional brass solution. With less equipment and floor space and with fewer solutions to maintain, you always will have savings. Coupled with greater production this can't help but mean better and less expensive operations and you will always get better deposits.

If you are plating brass you can benefit from using Brass-Glo. Full details will be sent on request.

** Patents pending.*

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serving the Finishing Field

Lea-Ronal, Inc., Jamaica, N. Y.
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Plating Polishing Buffing
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Lea-Ronal Inc.

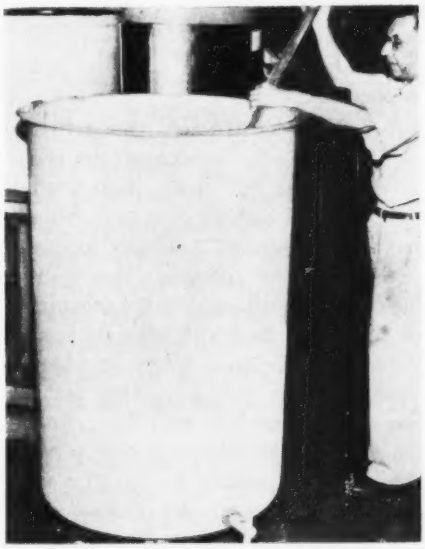
Main Office and Laboratory:
139-20 109th Avenue, Jamaica 35, N. Y.
Manufacturing Plant:
237 East Aurora Street, Waterbury 20, Conn.

Are you interested in Buffing, Polishing and Burring Specialties? **SEE THE OTHER SIDE OF THIS INSERT.**

Plastic Tanks

Delaware Barrel & Drum Co., Inc., Dept. MF, P. O. Box 1648, Wilmington, Del.

New low-cost chemical tanks with capacities of 5 up to 160 gallons are molded of Bakelite polyethylene in one continuous piece to prevent leaks and corrosion. The non-breakable walls are translucent enough to reveal the level of liquids inside. The remarkable resistance of polyethylene to corrosion by most chemicals enables



the use of these tanks to hold powerful caustics and strong or weak acids, even hydrofluoric acid. Molding these tanks in one piece eliminates the possibility of weak joints, welds or seams and reduces the danger of leakage. Low-cost tanks in sizes from 5 up to 160 gallon capacity are available in cylindrical, cubical or rectangular shapes, together with covers.

TANK HEATING PROBLEMS ELIMINATED!

CLEPCO FUSED QUARTZ IMMERSION HEATERS

Heating your acid tanks with Clepco Electric Immersion Heaters is the most modern and now the most proven of all methods known today.

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OVER 100,000 INSTALLATIONS PROVE *CLEPCO* FUSED QUARTZ IMMERSION HEATERS ARE BEST

Clepco Steel and Stainless Immersion Heaters are designed to meet the specific demands of the Alkaline Bath heating problems of the Industry.

WHEN A BETTER HEATER IS MADE, CLEPCO WILL MAKE IT.

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FUSED QUARTZ IMMERSION HEATERS

SEE YOUR PLATING SUPPLY HOUSE
WRITE US FOR LITERATURE

THE CLEVELAND PROCESS COMPANY

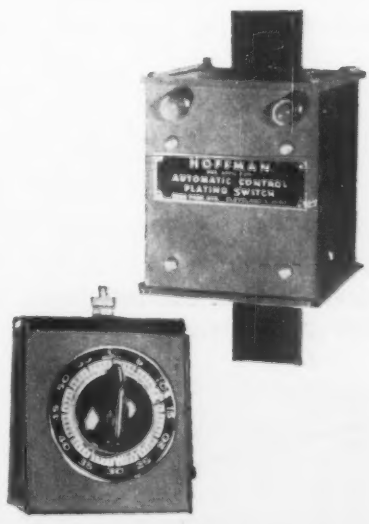
1965 EAST 57TH STREET • CLEVELAND 3, OHIO

Barrel Plating Control Unit

Hoffman Control Co., Dept. MF, 6804 Park Ave., Cleveland, O.

Separate, automatic plating-cycle control, in production barrel plating plants, for each tank, is achieved with a new control unit, it is claimed. A control box having two signal lights and an automatic cut-off time switch make up the new system. It is an improvement over previous models because it is more compact, lighter in weight and much lower in cost.

Installation is made easily and quickly by removing the cathode bar from each tank or near it to suit the convenience of the operator. The operator starts the current flow and the plating cycle by pre-setting the time on the switch dial. During the plating



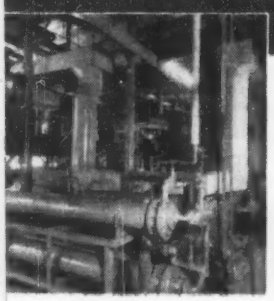
cycle the green light on the control box is on. It goes off upon completion of the cycle and the red signal light goes on. The red light signals the end of the plating cycle and shows that the current has automatically been cut off.

The controls permit the safe removal of each tank barrel without danger of arc-started hydrogen gas explosions. Since the current can be turned off at will, on each tank, burning and unnecessary corrosion of barrel contacting points and the splashing of solutions no longer occur.

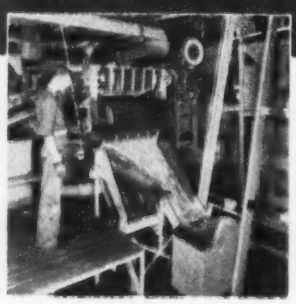
The control is available for immediate delivery in standard models having a capacity of 600 amps. and voltages from 5 to 15.



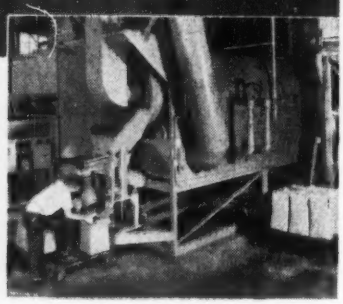
PLATING 400,000 POUNDS A DAY WITH THIS **UDYLITE** MACHINE . . .



End view showing exhaust system and heat exchangers.



Unloading station of Udylite Automatic Barrel Machine.



Drum type dryer used for drying bright zinc plated work.

Harding Manufacturing Company are bright zinc plating 20,000 pounds of small parts per hour with their Udylite Full Automatic Barrel Plater and are running it 20 hours a day.

Only four men are used in operating this Udylite machine. One man loads the feeder hopper. One man loads the cylinders. One man unloads the cylinders and one man unloads the dryer and dichromating operation—*5,000 pounds of plating per man hour.*

And with this tremendous production is all the desired versatility. The machine is so designed with electrical controls that the plating time and thickness of plating in each cylinder load can differ from other loads going through the machine cycle at the same time. The plating time for each load is predetermined by the operator at the time the cylinder is loaded.

This is another example of Udylite experience in production plating. If you have a plating problem—large or small—it will pay you to consult Udylite.

THE **Udylite** CORPORATION
DETROIT 11, MICHIGAN

WORLD'S LARGEST PLATING SUPPLIER

A New Heavy-Duty Plating Barrel

The Udylite Corporation recently announced a new heavy-duty plating barrel, with increase cylinder sizes.

The new barrel has a cylinder made of cemented Tempron hard rubber construction and is furnished in sizes of 16″ by 36″ and 16″ x 30″. These are inside dimensions of the barrel.

Udylite engineers selected Tempron hard rubber for the cylinders as it withstands even under load, the highest temperatures used in plating—it has a chemical resistance to a wide variety of corrosive solutions—great resistance to abrasion — strength to handle heavy loads and performs satisfactorily through the complete cycle of operations.

Ruggedly constructed, the cylinder has heads of 1⅛″ thickness, the regular panels are ⅝″ thick, door panels ¾″ thick and rails 2¼″ square. Superstructure construction follows long accepted Udylite design. Heavy-duty cast-brass contact saddles are machined for perfect contact with cathode horns. Self-locking feature prevents barrel cylinder from rocking. The plating barrel is designed so that the cylinder hangs low — to submerge its top completely. This results in greater current capacity and faster plating. The dangler contacts are the only exposed metal surfaces beneath the solution.

The new Udylite Plating Barrel will handle loads up to four hundred pounds and will plate surface areas up to one hundred square feet, depending upon the shape and size of the work to be plated. As the barrel will draw up to 1500 amperes at 18 volts, tanks are bussed for 1500 amperes. Solution working capacity is 430 gallons.

While the standard specifications of the new barrel plater are for cyanide plating cycles, it is also available for all normal alkaline and acid plating solutions. Where the new plater is to be used for acid plating, Koroseal-lined tanks are usually furnished, although, other linings are also available.

Two barrel rotating speeds are furnished—4 and 8 R.P.M. and the cylinders are individually driven by a ¾ H.P. Motor.

Special conforming anode containers are supplied with each plating barrel and these anode containers are anodically charged at both top and bottom for better current distribution.

According to Udylite engineers, this new high production barrel is capable of increasing production per man hour from 50 to 100% over barrels of the present standard sizes.

ADVERTISEMENT

New Filters

Recently introduced by the Udylite Corporation, a new line of filters answers the demands of the plating industry for fast filtering, low cost, portability and maximum simplicity of design.

One of the features of the new filters is a self-priming pump which saves time and adjustment in getting the filter into operation. A flip of the switch puts the machine to work.

These new Udylite-Detroit Filters also feature a stainless steel pump with a neoprene impeller and a lip seal which can be changed without dismantling the entire machine.

For high chloride solutions, Udylite-Detroit Filters are furnished with plastisol lined pumps and filter drums.

By the simple expedient of reversing the motor of the filter pump, complete back washing can be obtained. This method uses no air and elminates the necessity of other equipment.

Fresh water can then be pumped through the filter by attaching the outlet hose to a tank of fresh water. After flushing the filter, the waste is carried through the regular inlet hose to a sewer.

With this method of back washing, the machines can be recaked many times before the filter has to be opened for thorough cleaning.

The simplicity of the filters enables them to be back washed in a matter of minutes and returned to operation. The filter plates can be taken out by the removal of one nut.

Still another salient feature of these filters is the hollow, perforated, stainless steel filter plate in the filter drum, which permits the flow of a greater volume of solution per hour, with a low co-efficient of friction.

The cake does not drop in Udylite-Detroit Filters when the machine is stopped. By use of this new type stainless steel filter plate, filtering is accomplished at high speed.

The portability of the filters enables them to be quickly placed next to solution tanks in any section of the plant without use of dollies or lift trucks.

Their compactness requires little floor space and yet they process three to four times as much solution as other filters of comparable size.

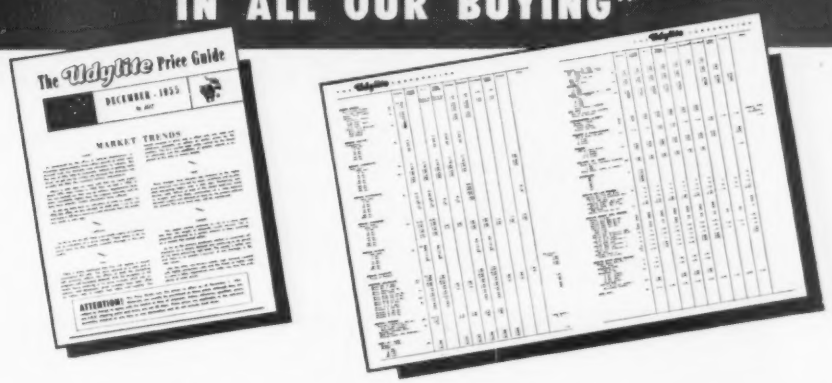
In addition to the low initial cost of Udylite-Detroit Filters, additional savings are realized in low cost and speed of operation. They give more filtered gallonage per dollar of initial cost and cost of operation.

The rated capacities of the two standard size filters are 350 gallons per hour and 1,000 gallons per hour. These ratings are with the filter cake.

ADVERTISEMENT



"WE USE THE *Udylite* PRICE GUIDE IN ALL OUR BUYING"



This statement by Phil A. Young, General Manager, Midwest Plating & Chemical Company, Kokomo and Logansport, Indiana, is typical of many busy executives throughout the country.

You, too, should take advantage of this regular buying service for electroplaters. The Udylite Price Guide keeps you abreast of the latest prices with its most complete listing of supplies—and now it lists the current prices from each of the nine Udylite stock points.

Issued bi-monthly, the Udylite Price Guide informs you on market trends, tells you about new items and new methods used in plating. Since its inception in 1945, it has grown steadily in size and circulation to its present effectiveness.

The Price Guide is another free service from Udylite. If your name is not on our present mailing list, send it in immediately. Write The Udylite Corporation, Detroit 11, Michigan, giving your name, address and the company with whom you work.

THE *Udylite* CORPORATION
DETROIT 11, MICHIGAN

WORLD'S LARGEST PLATING SUPPLIER

ATLANTIC GREASELESS COMPOUNDS *are unexcelled*

for fast, clean-working
POLISHING & BUFFING OPERATIONS
in the finishing of
METALS, PLASTICS, & WOOD.



Economy-pak foil lined, fibreboard container

ATLANTIC GREASELESS COMPOUNDS are produced by specialists with a background of long experience in the compounding and application of greaseless finishing materials.

The rigidly controlled uniformity of ATLANTIC COMPOUNDS helps you maintain your high finishing standards. This dependable uniformity is assured by the highest grade ingredients and by extremely close quality control in manufacturing.

Devoted exclusively to producing unexcelled greaseless compounds, Atlantic maintains constant research striving for continually improved products. Technical assistance and data available upon request.



Aluminum Tube

THE ATLANTIC COMPOUND CO.
1860 BALDWIN STREET WATERBURY, CONNECTICUT

Non-Metallics for Pump Impellers

Eco Engineering Co., Dept. MF, 12 New York Ave., Newark, N. J.

A report on recent findings with respect to the physical and chemical characteristics of non-metallic impellers for displacement pumps is set forth in a new four-page folder.

Synthetic elastomers, fluorocarbons and resinous laminates are surveyed and the influences on them of chemicals, mechanical and thermal stresses and other operational factors, are reviewed to give a general picture of the wide applicability of non-metallic materials in pump service.

A page is reserved to illustrating and describing several industrial applications of positive displacement pumps which are using non-metallic impellers suited to particular chemical handling problems, and to showing how a Neoprene and Hypalon impeller for corrosive aqueous solutions, is manufactured.

Metallizing Machine Features Simplified Air Governor Control

Vandersee Corp., Dept. MF, Route 22, Union, N. J.

This is one of the unique engineering features of the new Vanco metallizing machine. The dynamically balanced air turbine provides positive power control uniformly feeding metal wire without fluctuation, an important



factor in the operation of a metallizing machine.

The turbine is automatically governed by the propulsion fluid supplied to the primary and secondary turbine, so arranged that their opposing forces are in direct proportion to the change of volume or pressure of the fluid supply, encased in a one-piece gear case that assures positive bearing alignment for the high speed turbine and component parts.

Other improved features are the self-contained gas mixing chamber nozzle that completely eliminates danger of backfire, a hazard of gas operated equipment, and the new lightweight construction, (weight under 4½ pounds), that tends to eliminate operator fatigue.

Plastic Pumps

Vanton Pump & Equip. Corp., Dept. MF, 201 Sweetland Ave., Hillside, N. J.

The new XB series plastic pumps in 10, 15, and 20 G.P.M. sizes and discharge pressure ratings of 0 to 50 p.s.i., incorporate the basic features of the "flex-i-liner" design which eliminate entirely the need for stuffing boxes or mechanical seals of any sort. The fluid passing through the pump is never in contact with metal.

The new series in the higher capacity ratings offers a heavy duty continuous operating production pump. The pump head is mounted in cantilever fashion on a rigid cast iron pedestal. All permanently lubricated bearings are completely enclosed in stainless steel assemblies. The rotor and heavy duty shaft, which are not in contact with the transferred fluid, are also furnished in stainless steel to provide protection should the liner rupture. Thus, the only wearing re-

placement item is the inexpensive liner. The XB type mounting permits liner replacement in a matter of minutes by unskilled personnel, without necessitating removal of pump mounting, motor connections or pipe lines. The convenience of disassembly offered by this design is further enhanced by the addition of a finger grip which allows for the ready removal of pump body block without need for special tools.

Spray Type Plastisol

Michigan Chrome and Chem. Co., Dept. MF, 8615 Grinnell Ave., Detroit 13, Mich.

Miccrosol Spray S-2003 is stated to be a true 100% sprayable plastisol. It is sprayed as received with conventional spray equipment — no thinners or solvents are required. Films of 60 mils thickness can be applied in one application without sagging of material. If multiple coats are required, a short cure time is all that's needed between applications. A contrasting color can serve for layer identification, if desired.

The product has the same toughness, chemical, corrosion, and abrasion resistance as Miccrosol E-1003. It can be used as a coating for all plating baths and Miccro adhesive systems provide outstanding adhesion to metal surfaces. When properly applied and cured, S-2003 is equivalent on a per mil basis to E-1003, properly applied and cured. For cleaning ease, better rinsing and draining, as well as a handsome appearance, the exceptionally high gloss of the coating is definitely advantageous.

Marking Paint

Markal Company, Dept. MF, 3052 West Carroll Ave., Chicago 12, Ill.

A new paint stick for marking various products subject to acid and alkali conditions is said to be permanent, weather proof and fadeproof.



Markal D-A has been developed, the firm says, for marking metals subject to steam conditions, cleaning solutions or grease cutting solvents, acids and alkalis. On steel and iron, as well as non-ferrous metals, it is claimed to fully withstand pickling.

The stocks are available in colors of red, white, blue, green, yellow and black; each of these colors conforms to the A.I.S.I. color code for identifying alloys.

Further information on this paint stick may be obtained by writing directly to the manufacturer at the above address.

Multi-Tank Rinse Tank Controller

Industrial Instruments, Inc., Dept. MF, Cedar Grove, N. J.

A new automatic switching device for multi-tank installations in electroplating plants has been developed to eliminate the need for duplication of basic equipment and thus lower multi-tank automatic control costs.

Model ARPT-12 multi-point controller is a single housing containing the electronic controller and automatic switching device to connect the various test points into the controller circuit, as well as for switching solenoid valves.

Operation is relatively simple in



GET BEHIND IT!!

Put your metal cleaner *behind* the soil—between the soil and the metal—and you'll soon have the soil *off* the metal. That's the way you'll clean metal parts with . . .

Cowles NEW QC WASHING MACHINE CLEANER

Cowles NEW QC Washing Machine CLEANER penetrates through films of oil—crusts of drawing and stamping compounds—even into deeply recessed parts—pries the soil loose where pressure jets can't reach.

Improved penetrating, wetting, and emulsifying action in your washer without objectionable foaming.

GET THE COMPLETE STORY on this *brand NEW* Cowles QC Washing Machine Cleaner. **Send This Coupon.**

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Cowles CHEMICAL COMPANY
CLEVELAND 3, OHIO

See Cowles NS and FE advertisements on pages 99 and 103.

Testing For Causes of Rough Deposits?

9. Run a plating

By using a testing procedure it
determine chemical adjustment, addition agent
and bath treatment necessary to return the bath to nor-
mal plating. Such testing may also indicate the need
for greater filtering capacity or for continuous filter-
ing. If filtering is required on a laboratory scale to ob-
tain satisfactory test results then filtering is required
to obtain quality production plating.

Filtering Methods

method for filtering plating baths with a



SEND FOR THIS SPECIAL METAL FINISHING REPRINT

This article — "The Use of Filters in Electroplating" — by Mr. J. B. Mohler, Metal Finishing consultant; especially reprinted from the Metal Finishing Magazine is available to you for the asking. For your free complimentary copy write Alsop Engineering Corp., 1102 Bright Street, Milldale, Connecticut.

ALSOP ENGINEERING CORPORATION *Positive Filtration* *FIRST STEP IN CUTTING COSTS*

principle. Automatically, it switches in rotation up to twelve test points. Each test point, or conductivity cell is, therefore, in the circuit for 10 seconds. If conditions within the tank being tested are satisfactory, the controller switches to the next tank, which is tested for 10 seconds. This process continues until a tank is found to be outside the pre-set limitations. Opening and closing of valves to remedy the unsatisfactory condition is automatically accomplished when the tank is tested.

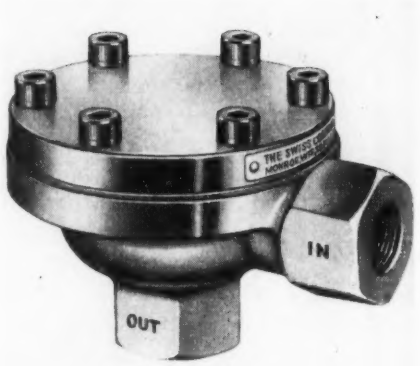
The use of this multi-point controller eliminates the need for a separate controller for each tank and results in substantial initial cost savings.

Temperature Controller

Engineering Division, The Swiss Colony, Dept. MF, Monroe, Wis.

Unvarying temperatures for steam-heated production are provided with the Temp-a-sure condensate control, which utilizes latent heat and measures and controls changes in heat energy that do not appear as temperature fluctuations.

Equipped with the newly designed Ni-Span diaphragm, the unit responds instantly with 100 per cent modulation. It is claimed to provide exact temperature control and, at the same time, removes non-condensables from the steam line. The device has a capacity for any temperature or pressure from 70° to 400°F. (250 psi.) operating within one degree of saturated steam temperature.



The unit is easily installed because it is pre-set at the factory. It is fully automatic and requires neither special controls nor adjustment by trained technicians. Water hammer cannot damage the trouble-free liquid-loaded diaphragm.

The working area is approximately three square inches, compared to 0.66 square inches in a comparable bellows. It never completely closes off, thus saving an additional 0.20 square inches. The valve merely closes down to the necessary fraction for complete control, eliminating the need for additional force to reopen the valve. This fully modulating movement avoids the lag associated with most condensate controls.

The unit is available in two working pressures—100 and 200 maximum p.s.i.g. Orifice sizes are ½" and ⅜".

Centrifugal Fans

Chicago Blower Corp., Dept. MF, 9869 Pacific Ave., Franklin Park, Ill.

The new Airfoil centrifugal fans achieve unequalled efficiencies of above 92% and operate on 35% less power than is required by conventional flat-blade fans of the same capacity. Noise level is also reduced by 65%, it is claimed.

The device is a backward curve, non-over-loading fan that features new hollow-sectioned aerodynamic shaped airfoil blades. This blade design, the first completely new departure in 40 years from the standard flat bladed backward curved types, entirely eliminates eddy currents that create turbulence and noise.

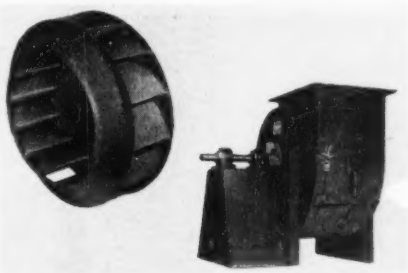
The die-formed hollow section blades are welded to a heavy steel

back plate, to which has been welded a solid turned steel hub. All wheels utilize an aerodynamically designed plate or shroud spun from heavy gauge steel, which is welded into place and acts as the outside support for the blades, which are carefully balanced, both statically and dynamically.

Housings are of continuous-weld heavy plate steel. Individual sections are welded to provide a dust-proof and leak-proof housing. When space limitations require fans to be knocked down, they can be furnished with flanged and "broken" sections.

Spun type aerodynamic inlet cones reduce air turbulence and increase operating efficiency. The bolted inlet ring, or front support section, holds the deep draw spinning of heavy gauge steel in place against the side of the fan housing.

All classes of fans are furnished with heavy-duty single or double race, self-aligning ball bearing pillow blocks, with roller bearings in the larger fans.



Ring oil babbitt bearings can also be supplied when specified where extremely quiet operation is required. Shafts are made from carefully selected open-hearth steel. Drives are direct or V-belt.

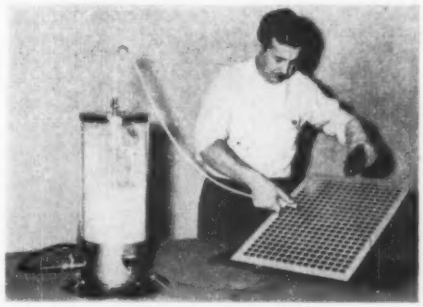
Wheel sizes are from 13½" in diameter to 143" with air deliveries of 600 to 1,000,000 cfm. ⅛" to 32".

Protective Coating Process

American Agile Corp., Dept. MF, 5461 Dunham Road, Maple Heights, O.

The above firm has announced a modification of its fluidizing equipment to permit spraying of targets which cannot be accommodated by the basic dipping technique. The new fluidized process of protective coating provides corrosion-resistant coatings of polyethylene, polyfluorocarbons, Nylon and other plastics on metallic and dissimilar plastic molded targets.

Key to the fluidized process is a dual-purpose powder fluidizer, a compact unit consisting of a specially designed compressed air distribution system which maintains the plastic powder in a dense dry turbulent state. Targets to be coated are preheated in a standard oven or with a flame, then immersed in the fluidized bed for only a few seconds. This provides a uniform coating up to $\frac{3}{16}$" thick on even the most intricate shapes. When the heated object is removed from the powder bed, the residual heat is usually sufficient to melt and level the adhering powder particles to a smooth non-porous resin cladding. The result is a tough adherent corrosion barrier, ready for immediate use.



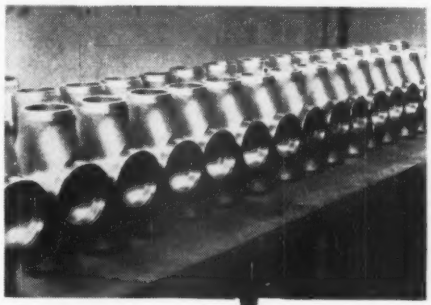
Where the size of the object to be coated exceeds the diameter of the chamber, a fluid-powder spray unit, which fits over the top of the fluidizing chamber, can be attached and used.

For added flexibility, the powder fluidizer is also equipped with a fluid-powder spray unit which fits over the top of the fluidizing chamber. Where the size of the object to be coated exceeds the diameter of the chamber, or where certain interior surfaces pro-

Kanigen®

A NEW ALLOY COATING

New properties! New applications! Kanigen® process deposits, by chemical means, from a chemical bath, a *uniform, hard, corrosion-resistant* nickel-phosphorus coating on iron, copper or aluminum and their alloys . . . . without the use of electricity. Here are only a few of many applications . . . . for detailed data send for "Kanigen Bulletin".



▲ *Globe Valves with Kanigen Coating*

UNIQUE PROPERTIES

Hardness can be varied from 50 to 70 Rockwell C. Here's surface hardness for aluminum and brass — permits soldering — uniform even on complex shapes . . . . accuracy of coatings up to .007" eliminates post-grinding operations.

Virtually zero porosity makes Kanigen superior to electro-deposited nickel of equal thickness. Protects material in process from iron pick-up. Serves as intermediate or bonding coat.

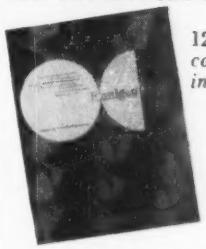
◀ *Kanigen coated Steam Engine Piston Rod*



Solutions and equipment sales. Contract coating Services

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12-page Bulletin gives complete technical information and uses

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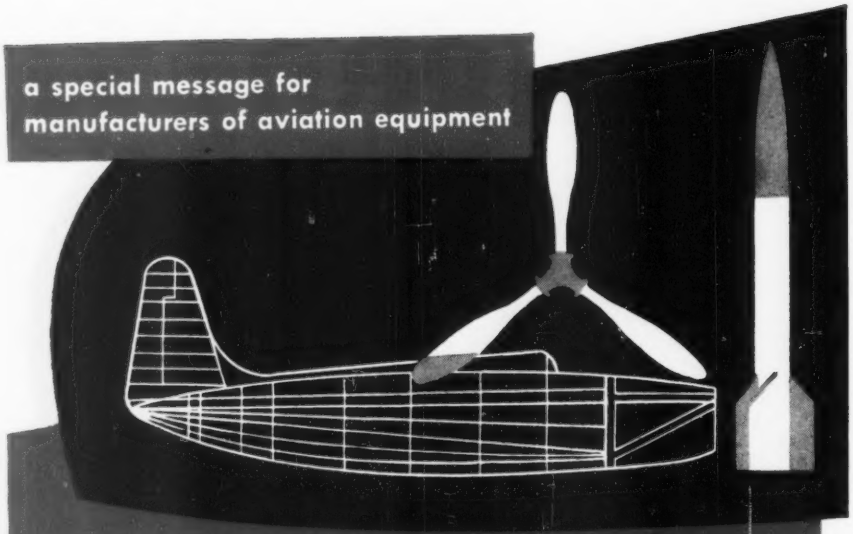
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a special message for
manufacturers of aviation equipment



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light metal parts?

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IRIDITE®

Here's the finish that combines corrosion resistance and paint adherence with extreme ease of application. It can be welded or soldered with no difficulty and presents no problem in "patching" scratches, marks or scraped sections. Here's what you can do with Iridite:

ON ZINC AND CADMIUM you can get highly corrosion resistant finishes to meet any military or civilian specifications and ranging in appearance from olive drab through sparkling bright and dyed colors.

ON COPPER . . . Iridite brightens copper, keeps it tarnish-free; also lets you drastically cut the cost of copper-chrome plating by reducing the need for buffing.

ON ALUMINUM Iridite gives you a choice of natural aluminum, a golden yellow or dye colored finishes. No special racks. No high temperatures. No long immersion. Process in bulk.

ON MAGNESIUM Iridite provides a highly protective film in deepening shades of brown. No boiling, elaborate cleaning or long immersions.

AND IRIDITE IS EASY TO APPLY. Goes on at room temperature by dip, brush or spray. No electrolysis. No special equipment. No exhausts. No specially trained operators. Single dip for basic coatings. Double dip for dye colors. The protective Iridite coating is not a superimposed film, cannot flake, chip or peel.

WANT TO KNOW MORE? We'll gladly treat samples or send you complete data. Write direct or call in your Iridite Field Engineer. He's listed under "Plating Supplies" in your classified phone book.

Iridite is approved under government specifications

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Manufacturers of Iridite Finishes for Corrosion Protection and Paint Systems on Non-Ferrous Metals, AEP Plating Chemicals.
WEST COAST LICENSEE: L. H. Butcher Co.



hibit maximum benefits from immersion, the spray unit is affixed to allow the powder to flow through the flexible hose and emerge through an easily-manipulated spray-pattern control. There is no limit to the size of the object to be so coated other than limitations of preheating facilities.

The dual-purpose fluidizing equipment thus permits on-the-spot corrosion protection when and where needed, at an exceptionally low cost, and inasmuch as 50% less time than was required with conventional spraying equipment working on a vacuum principle.

Electroless Nickel Units

Metal Processing Co., Dept. MF, 41 Canfield Road, Cedar Grove, N. J.

Electroless nickel plating tank was designed as the most practical and economical after a year of intensive research and test. The unit features a



hot water heating jacket surrounding a liner coated with a trifluorochloroethylene type plastic, continuous filtration and gravity feed of chemicals for continuous operation. The 50-gallon unit illustrated is ideally suited for basket or barrel operations when extremely thin plated coatings are required. The standard line also includes 100 and 250 gallon sizes. Other sizes can be designed and manufactured on order.

Additional information on electroless nickel plating may be obtained by writing directly to the manufacturer at the above address.

BUSINESS ITEMS

E. G. Holmberg Joins International Nickel

Emil G. Holmberg, who has had wide corrosion experience in a number of major industries, has joined the Corrosion Engineering Section of the *International Nickel Co.'s* Development and Research Division in New York.

Before joining Inco, Mr. Holmberg for nine years was chief metallurgist of the Alloy Steel Products Co., Linden, N. J., prior to which he had served for 11 years as a metallurgist with E. I. du Pont de Nemours & Co., at its Belle Works in West Virginia, and for three years as an instructor in engineering subjects at the Newark School of Fine Industrial Arts, Newark, N. J.

Mr. Holmberg holds the degree of Engineer of Mines from the Colorado School of Mines. He is the author of a number of technical papers and articles dealing with corrosion.

Bauer Appointed by Doehler-Jarvis

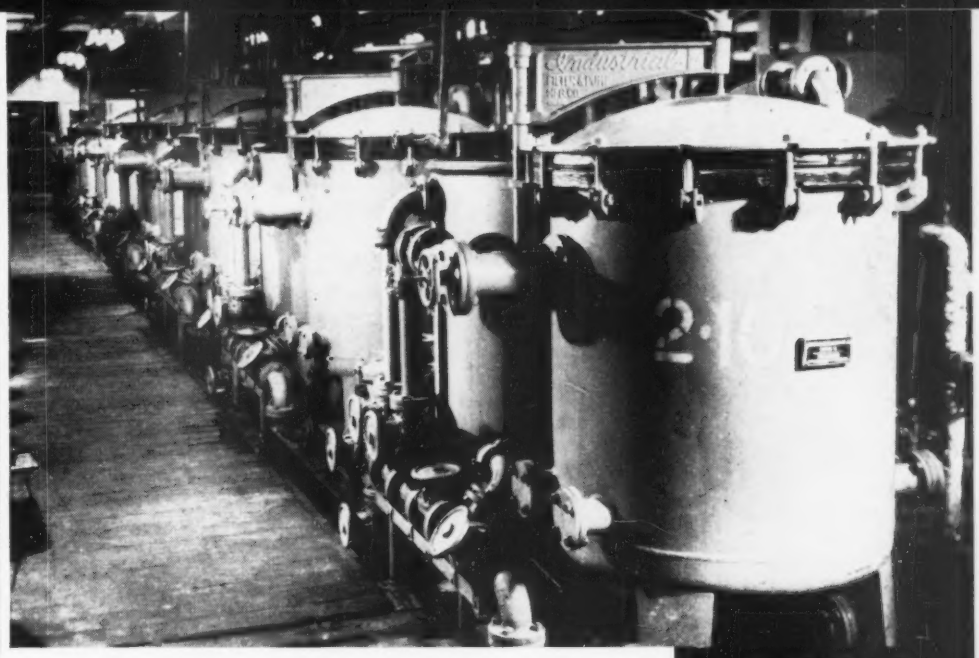
Alfred F. Bauer has been appointed assistant general manager of the Doehler-Jarvis Division of *National Lead Co.* Formerly chief engineer of the division, Mr. Bauer will continue to function in that capacity.

Mr. Bauer was born and educated in Germany. He managed the die casting facilities of the Mahle Organization in that country before coming to the United States in 1947. He joined the Dow Chemical Co. in 1948 and several months later he was made superintendent of its magnesium die casting department. In 1949 he was made manager of the department.

In 1951 Mr. Bauer came to Doehler-Jarvis and joined the research staff in Toledo, Ohio, as an assistant to the director of research and engineering. A year later he was appointed chief engineer of the division.

Townsend to Study Nickel Situation

Arthur S. Flemming, Director of Defense Mobilization, has stated that *John R. Townsend*, director of materials and standards engineering of the



SOLVE COMPLEX FILTER PROBLEMS

...WITH INDUSTRIAL'S NEW BUILT-TO-ORDER FEATURES

Industrial offers much more than a line of standard filters . . . a complete filtration engineering service from fluid analysis to installation. Industrial is ready and able to help you specify the right equipment for common or unusual needs.

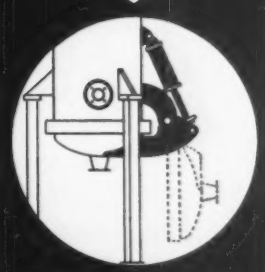
Easily adapted for special uses . . . these Vertical Filters typify Industrial engineering . . . purposely designed to be built for your exact needs. Several of the many possible modifications are shown at the right . . . for recovery of large volumes of solids the bottom opening filter is ideal; for smaller volumes, the clean out door is more practical and less costly. Another example of specialization is the jacketed shell filter, for use where small temperature variations are important. Other optional features are quick-opening covers, individual leaf outlets and self-cleaning devices that offer sluicing, shaking or air wash cleaning.

Lower filtration cost . . . proven performance, minimum down time, the use of low cost but efficient filter media plus a design exactly suited to your needs, all contribute to Industrial's low over-all cost per gallon of filtrate.

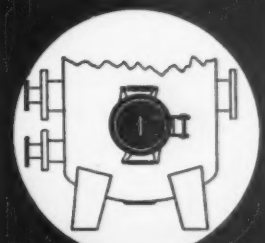
Write now for details on flow systems, special equipment, filter and leaf construction. Ask for 8 page Bulletin 111.



MODIFICATIONS



RECOVERING LARGE VOLUMES OF SOLIDS



RECOVERING SMALL VOLUMES OF SOLIDS



JACKETED SHELL FOR UNIFORM TEMPERATURE

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CENTRIFUGAL PUMPS · PRESSURE FILTERS · ION AND HEAT EXCHANGERS · RUBBER LININGS · WASTE TREATING EQUIPMENT

how to substitute aluminum *for copper in electrical manufacturing*

Due to the high cost of copper, repeated attempts have been made to substitute aluminum for this costly metal for electrical purposes. While it is true that more aluminum than copper is required to transmit a given electrical impulse —the lower cost of aluminum makes the substitution very attractive from a cost standpoint. Unfortunately, on all previous attempts to use aluminum for electrical conductivity the aluminum corroded, causing poor contacts and subsequent failure of the mechanisms involved.

And that's where KENVERT 40 comes in—*a chrome sealer especially designed to prevent the oxidation of aluminum* by sealing it with a film having a very low microhm resistance.

Write for complete details or send us specification data concerning your problem. We will be glad to advise you.

CONVERSION CHEMICAL CORPORATION

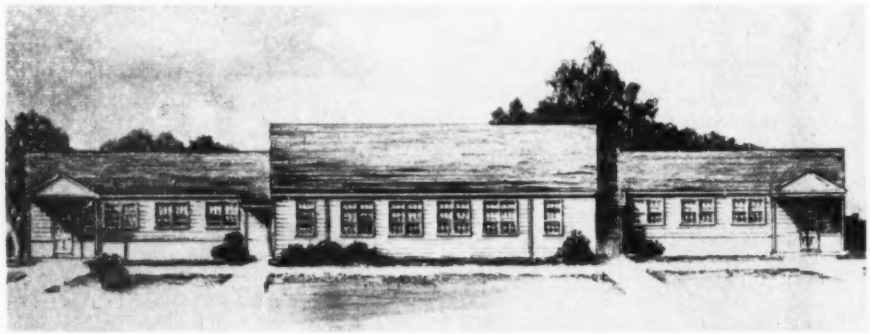
98 E. MAIN STREET, ROCKVILLE, CONN.

Sandia Corp., has agreed to make a study for him of the current and prospective nickel situation with particular emphasis on our defense position for this metal and the impact defense requirements are having on the civilian economy.

In his study, Mr. Townsend will analyze all Government activities relating to nickel, including the stockpiling and expansion programs, as well as the set-asides for military and atomic energy needs. The metal, which has extremely important uses in defense equipment, has been in short supply in the civilian economy for some time.

In addition to his present duties with the Sandia Corp., Mr. Townsend serves as chairman of the Materials Advisory Board, National Academy of Sciences .He has been president of the American Society for Testing Materials, and chairman of the Standards Council of the American Standards Association. He was also a member of the Technical Industrial Intelligence Group that went to Germany in 1945 and he served as materials consultant to ODM a few years ago.

Foxboro Building New Instrument Training Center



Reflecting industry's increased demand for trained instrument personnel, *The Foxboro Co.*, Foxboro, Mass., is doubling the size of its Training and Education Center. Scheduled for completion early in 1956, the new building will accommodate 46 trainees, nearly twice the number handled previously.

Plans call for two 20-student classrooms, two laboratories where bench instruction and service training can be given, an instrument demonstration room, a conference area, and enlarged quarters for the expanding teaching staff.

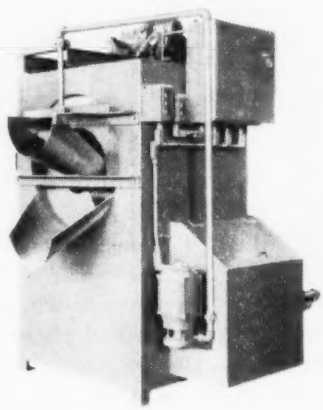
Completion of the new facilities will help reduce the customary waiting period for customers' men who enroll in the various courses of instruction. Nearly twice as many courses will be offered, these to include specialized

Now..Wash Small Parts in Bulk—Faster and at Less Cost!

New A-F Small Parts Batch Washer

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- ONE-MAN OPERATED

Parts batches are introduced through upper chute . . . automatically discharged from lower chute—clean as whistle and flash-dried. High-pressure fan-shaped spray nozzles and gentle helical spiral tumbling assure quick, low-cost cleaning.



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A-F *ENGINEERED* Cleaning and Finishing Machines
Plant-Wide Conveying Systems
Pre-Engineered Conveyors—Rollers, Wheel, Belt, Trolley

THE ALVEY-FERGUSON CO., 500 Disney St., **CINCINNATI 9, OHIO** and Azusa, California

training in electronic instruments and advanced forums for various industry groups, as well as the standard three-week general courses which cover all phases of instrument work.

Revealing the expansion plans, the company's Director of Training *W. H. T. Furry* also announced the appointments of *Norman A. Anderson* and *John B. Parkes, Jr.* to the training staff which now includes five full-time instructors in instrumentation.

Columbia-Southern Chemical Corporation to Expand

Columbia-Southern Chemical Corp. has disclosed plans for an extensive expansion of research and development work at the company's Barberton, Ohio, plant. The program will cost in excess of a million dollars and will include the construction of an ultra-modern research building.

The new research unit, containing about 40,000 square feet of floor space, will be located adjacent to the company's extensive chemical manufacturing facilities at Barberton. It will have three floors plus a b ment and will include a library and conference room in addition to laboratories and offices.

Nickel Processing Corp. Appointments

Sherman A. White and *Floyd E. Albertson* have been appointed assistant general managers of *Nickel Processing Corp.*, operators of the U. S. Government-owned nickel plant at Nicaro, Cuba. *National Lead Co.* is majority owner of the corporation. The appointments were effective January 1, 1956.

Mr. White has a B. S. degree in mining engineering from the University of Washington. He joined National Lead in 1948 as general superintendent of its Mexican antimony mines. In 1950 he was transferred to Fredericktown, Mo., as mining superintendent of the company's St. Louis Smelting and Refining Division operation. In 1951 and 1952 Mr. White returned as general superintendent of the Mexican mines. In 1953 he went to Cuba as general superintendent of mines for Nickel Processing Corp.

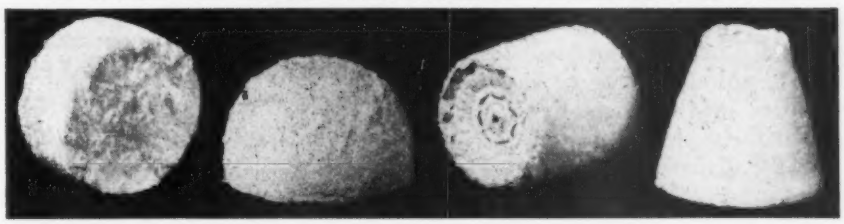
Mr. Albertson has a B. S. degree in mining engineering and a M.S. degree in metallurgy from the University of Idaho. From 1947 until 1952 he was employed as mill superintendent for Compania Minera de Oruro in Bolivia. He came to National Lead in 1953 as assistant mill superintendent at the company's MacIntyre Development at Tahawus, N. Y. In July of that year he went to Nicaro as general plant superintendent.

Dr. George T. Paul Joins Inco's Corrosion Engineering Section

Dr. George T. Paul has joined *The International Nickel Co., Inc.* as a member of the Development and Research Division's Corrosion Engineering Section in New York. One of Dr. Paul's first undertakings will be the preparation of a book on the corrosion resistance of stainless steels.

Dr. Paul holds the degrees of Doctor of Philosophy, earned in the Department of Chemical Engineering.

BUFFS FOR INSIDE POLISHING



GOBLET BUFFS, TAPER BUFFS, CYLINDER BUFFS, SMALL POLISHING WHEELS, RAZOR EDGE BUFFS, and many others for deburring, polishing and grinding any internal contour.

Write for additional information or contact your local dealer. These buffs are stocked by many dealers throughout the country.

We manufacture a COMPLETE LINE OF BUFFS including full disc loose and sewed buffs and polishing wheels. Our metal center BIAS TYPE BUFF may help cut your polishing costs.

Your request on your letterhead will bring our complete catalog by return mail.

BARKER BROTHERS INC.

ESTABLISHED 1911

1660 Summerfield Street Brooklyn 27, N. Y.

Canadian Distributor — LEA PRODUCTS COMPANY, Montreal

Du-Lite



a proven BLACK FINISH for STAINLESS STEEL

LOW TEMPERATURE

Du-Lite 3-0 blackening bath can be operated at 240°F or less, much lower than other processes require for blackening stainless.

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Low-temperature 3-0 process colors without surface damage, virtually eliminates costly spoilage of finished parts.

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EASY, SAFE OPERATION

Du-Lite 3-0 requires no carboys, special equipment, or unusual safety precaution. Ordinary cleaning rinses, low operating temperatures and cold water final rinse eliminate processing dangers.

GUARANTEED

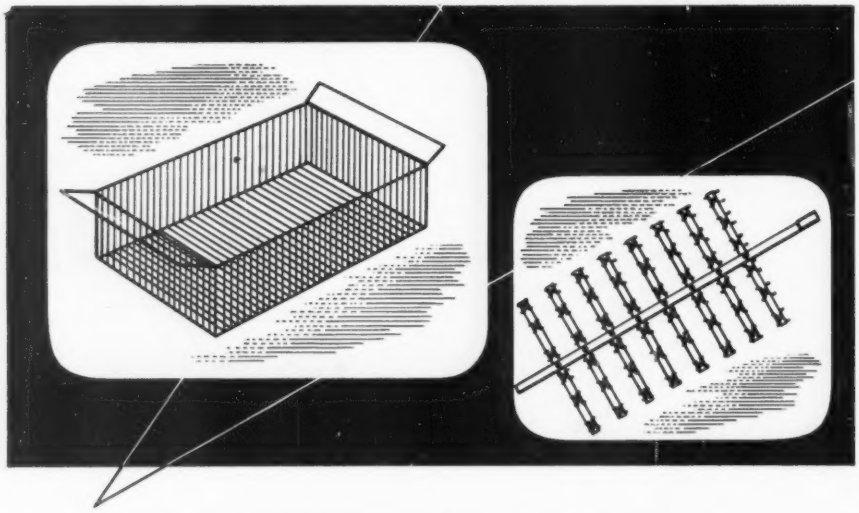
Du-Lite 3-0 is made and guaranteed by Du-Lite, the metal finishing specialists. Depend on Du-Lite for all your cleaning and finishing problems.

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PLATING EQUIPMENT STANDS UP LONGEST...
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Racks and other containers handle work with care if they're coated with one of Stanley's complete line of plastisols. High resistance to most chemicals plus a slick surface for fast drain-off and minimum carry-over add up to surface protection that lasts. If your operation uses trichlorethylene or perchlorethylene, specify Stanley 77X-1078 orange plastisol. Write for details to Stanley Chemical, 81 Berlin St., East Berlin, Conn.
Midwest representative: Russ-Howell Agency, Detroit and Grand Rapids.

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Raymond Day

and Master of Arts (in chemistry) Columbia University, and the degree of Bachelor of Arts from Columbia College. A former member of the faculty of Princeton University, he was on the staff of the Chemical Engineering Department for 10 years as an instructor and an assistant professor. While at Princeton he was also associated with the Textile Research Institute as a research engineer.

Before joining Inco, Dr. Paul was with the American Cyanamid Co. as a chemical engineer in the Process Engineering Section of its Organic Chemicals Division at Bound Brook, N. J. Earlier in his career, he was with Imperial Paper & Color Corp., Glens Falls, N. Y.

The author of several technical papers, Dr. Paul is a member of the American Chemical Society, The Electrochemical Society, American Institute of Chemical Engineers, National Association of Corrosion Engineers, Scientific Research Society of America, and the Society of the Sigma Xi.

R. J. Day Joins Canadian H-VW-M

On November 1, *Raymond Day* joined the sales department of *Canadian Hanson & Van Winkle Co.* in Toronto. He will operate from the head office and will service the central portion of metropolitan Toronto. For the past eight years Mr. Day has been in the laboratory of the John Inglis Co. and, for the past five years, has been laboratory supervisor responsible for electroplating, phosphating, paint and ceramic controls, and practices. Mr. Day is on the executive of the Toronto branch of the American Electroplaters' Society and a member of several other technical groups.

Edmund M. Wise Promoted by Inco

The appointment of *Edmund M. Wise* to be assistant to the vice-president-manager of the Development and Research Division has been announced by *The International Nickel Co., Inc.*

Mr. Wise graduated in Metallurgy from the University of Wisconsin in 1919. After service with the Wadsworth Watch Case Co. as metallurgist and director of research he joined Inco in 1927 to take charge of platinum metals research at the Research Laboratory at Bayonne, N. J. While there, he became assistant manager and general staff advisor. In 1933 Mr. Wise moved to the New York office to be head of the development and research activities in the fields of platinum metals and applied physics.

He is a member of several technical societies and has contributed importantly to the technical literature on the age hardening of non-ferrous alloys as well as platinum in its many fields of application, plus numerous papers on the magnetic and other eelctrical properties of nickel and nickel alloys — especially as used in electronic devices.

Dugan Sales Engineer for Whitfield

Whitfield Chem. Co., Detroit manufacturers of industrial metal cleaning



James E. Dugan

and finishing chemicals, announces the appointment of *James E. Dugan* as sales engineer covering parts of Michigan, Ohio, and Indiana. Mr. Dugan was formerly associated with General Motors and with Chrysler Corporation.

Gilmore to Represent General Ultrasonics Co.

The General Ultrasonics Co. of Hartford, Conn. announces the appointment of *Henry Gilmore, Jr.* as their engineering and sales representative in the Middle Atlantic area for the application of this firm's ultrasonic processing equipment in the fields of electroplating, cleaning, pickling and for research and development purposes.

Mr. Gilmore was formerly associated with the Sunshine Scientific Instrument Co. and the Westinghouse Electric Corp. in both technical and sales capacities. He graduated from North Carolina State College in 1947 with high honors in engineering, and served in the armed forces as a lieutenant in the Signal Corps from 1943 to 1946.

Mr. Gilmore has established offices at 205 Rodman Ave., Jenkintown, Pa. Tel. TUrner 7-4546.

Elected to Editors Group

Palmer H. Langdon, of the staff of *Metal Finishing*, has been elected to the Executive Committee of the Society of Business Magazine Editors (SBME), who meet from time to time in Washington and other cities to confer with Government and industrial leaders and to discuss editorial techniques.



The time to clean up *your* decorative plating is *before you put it on.* You'll be sure the base metal is chemically clean with Cowles FE Electro Cleaner in your electro tank.

Get rid of the blisters and blemishes *before* they show up.

Cowles FE Electro Cleaner

gets *all* of the soil because it *gets to* all of the soil. No crevice or corner escapes its soil-penetrating power.

GET THE FULL STORY ON HOW Cowles FE ELECTRO CLEANER penetrates soil (rapid wetting) dislodges soil (high current capacity) disperses soil (thorough emulsifying)

Ask your Cowles Technical Man—or send this coupon for Technical Bulletin about Cowles FE Electro Cleaner.

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City_____ State_____

Cowles CHEMICAL COMPANY
CLEVELAND 3, OHIO

See Cowles NS and QC advertisements on pages 91 and 103.

Stauffer Appoints Beattie

Edward Beattie, has been appointed Chicago district sales manager of *Stauffer Chemical Co.*

Mr. Beattie is a graduate chemical engineer with experience in the fields of both production and sales of industrial chemicals. He will report to *Harold J. Klee*, the company's central division sales manager at Chicago.

Ramco Appoints Cleveland Distributor

Ramco Equipment Corp. announces the appointment of the *Baker Distributing Co.*, Cleveland, Ohio, as an authorized distributor for Ramco vapor degreasers, power washers and allied finishing equipment.

J. C. Baker, president, was formerly with the research division of Rheem Mfg. Co. Baltimore, Md.

The Baker organization will cover Ohio, Indiana and Western Pennsylvania.

Ross Named Distributor for Chandeysson Generators

The appointment of *F. H. Ross & Co.* as its distributor in seven Southeastern states has been announced by the *Chandeysson Electric Co.* of St. Louis. Ross will handle the complete Chandeysson line of low-voltage motor generators for all types of plating, tinning and electrolytic work.

The Ross company has offices throughout the industrial South at:

Charlotte, N. C.; Greensboro, N. C.; Atlanta, Ga.; Jackson, Miss.; Jacksonville, Fla.; Knoxville, Tenn.; Birmingham, Ala.; Mobile, Ala.; Columbia, S. C.; Raleigh, N. C.; Columbus, Ga.; Savannah, Ga.

Morton Gilbert New Stokes Sales Engineer in Chicago

Morton B. Gilbert has joined the Chicago district staff of *F. J. Stokes Machine Co.* as a sales engineer.

Born in Lynn, Mass. and educated in the public schools of Haverhill, Mr. Gilbert was graduated from the University of Massachusetts in 1949 with a B.S. in Chemistry. For the next year he did graduate work at Kansas University, where he held a teaching fellowship.

Mr. Gilbert then switched to the business field, spending the next four years as a salesman with the Boston branch of the Central Scientific Co., covering Central and Western New York State, and a year with Consolidated Vacuum Corp., in Rochester, N. Y.

Mr. Gilbert is married to the former Adelaide Zornow of Rochester. They live at 5416 Sheridan Road, Chicago.



Morton B. Gilbert



Cecil P. Nankervis

Nankervis Opens Flint Sales Office

The *George L. Nankervis Co.* of Detroit has announced the opening of a Flint sales office for the convenience of its Flint, Bay City and Saginaw area customers.

The office staff will be under the direction of *Cecil P. Nankervis.* A resident of Flint for many years, Nankervis is a former president of the Flint Industrial Executive Club and is active in city civic affairs. Offices will be located at 1204 Metropolitan Building.

Industrial Filter Breaks Ground for $500,000 Plant Expansion

Industrial Filter & Pump Mfg. Co. of Chicago has broken ground to start

TAKE THE **LOAD** OFF YOUR **TOP BRASS**



USE **TRUE BRITE BRASS SOLUTIONS**

Trouble Free — Low Cost
Little Supervision Needed
Ready To Use — Just Add Water
Uniform Color — Can Match Colors

Write For Bulletin on Brass Plating

TRUE BRITE CHEMICAL PRODUCTS CO.
BOX 31, OAKVILLE, CONN.

★ **BUFFING NU SPRA GLU**
Liquid buffing compound since 1945

★ **NUGLU**
Cold flexible glue since 1937

★ **BRUSHING NUGLU**
Grain and Nuglu mixture since 1941

★ **SPRAY BUFFING EQUIPMENT**
Guns, pumps, and valves since 1945

J. J. Siefen CO.
5643 LAUDERDALE · DETROIT 9, MICH.



Management of Industrial and contractor participate in ground breaking ceremony. Left to right: Anton Mourek, Contractor; A. E. MacQuilkin, Comptroller; S. C. Clements, Chief Engineer; Hans Jensen, Vice-President in charge of Production; J. C. Hesler, Manager Waste Treating Department; R. E. Liedberg, Executive Vice-President; R. F. Ledford, Director of Sales; G. Lundberg, Purchasing Agent and C. Lundberg, Construction Superintendent.

the construction of a $500,000 west wing plant expansion. This second expansion represents a tremendous growth of 100% in plant area since 1953.

The laboratory and engineering departments are being enlarged 100% to solve specific problems for clients. Since 1953 the personnel of the engineering department has been increased 300%, chemical engineers 400% and skilled workers 50%.

According to Mr. R. E. Liedberg, executive vice-president, the plant construction is estimated at $350,000 and new equipment at $150,000.

H-VW-M Announces Major Price Reduction on Germanium Rectifiers

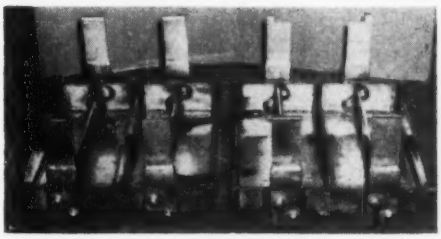
A major price reduction on all germanium rectifier models made by *Hanson-Van Winkle-Munning Co.* was announced by the company.

Some prices are reduced as much as 25% depending on voltage and type of voltage control. All price changes on germanium rectifiers are effective February 1, 1956.

C.S.C. Names Coveney District Manager

Raymond M. Coveney has been named manager of the Boston sales district of the Industrial Chemicals Dept., Petrochemicals Div., *Commercial Solvents Corp.*

Mr. Coveney will direct the company's sales operations on industrial chemicals in the New England states. He will continue to make his headquarters at 50 Terminal St., Boston, Mass.



Anodes by STORTS

WHETHER your needs are for standard or special designs — plain or fancy — Storts is prepared to serve you the same dependable quality anodes that have kept our customers re-ordering for more than twenty years. Storts anodes have a long-standing reputation for high performance utility and are backed by a complete satisfaction guarantee.

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The **DALIC** PROCESS OF ELECTRODEPOSITION

Used extensively throughout the Aircraft, Electronic, Electrical and Allied Industries for localized and "on site" plating.

Deposit	Maximum Current Density Amp./ft.²	Time to Deposit 0.0001 in.* (secs.)
Cadmium	6.000	2.5
Chromium	4.000	63.0
Copper	6.000	2.5
Germanium	4.000	—
Gold	2.000	6.2
Indium	4.000	2.5
Iron	3.000	10.2
Lead	5.000	3.8
Nickel	5.000	5.1
Nickel (Black)	5.000	—
Platinum	3.000	17.5
Rhodium	3.000	70.0
Silver	1.250	5.1
Tin	5.000	2.5
Zinc	3.000	3.8

* On an area equal to the pad electrode used.

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Research Laboratory

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A dark, hard, stable olive drab coating. Applied in about 15 seconds at room temperature. Gives maximum corrosion protection. Meets most rigid specifications. Available in one package.

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A powdered product to produce a bright clear conversion coating on zinc and cadmium.

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Designed for preparing a zinc alloy die casting prior to treatment in our Luster-On acid baths. Also serves as a mild cleaner. However, heavy soil must be handled by a precleaner.

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The answer to "spotting out" troubles on thin copper and brass plate, especially under humid conditions. Improves adhesion, provides leveling action, saves lacquer. Eliminates fingerprints before assembly.

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Produces a chromate film on aluminum that provides excellent corrosion protection and can serve as a paint base. Now can be dyed in many attractive pastel colors. Meets requirements of Government Spec. MIL-C-5541.

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Ask for literature. Send a sample for free laboratory treatment.

Luster-On products are manufactured on the West Coast by Crown Chemical and Engineering Company of Los Anaeles, Calif., and in the Dominion of Canada by Alloycraft Limited of Montreal, Quebec.

You'll also be interested in our SafetyDivision's line of industrial skin cleaners and protectors . . . protect your workers and your products. Literature available.

L-18

THE Chemical CORPORATION
58 WALTHAM AVENUE
SPRINGFIELD, MASS.

A native of Boston and a graduate of Holy Cross, Mr. Coveney joined the firm in 1951.

Poor & Company Promotes Two

Following the recent death of *Allan E. Chester*, vice-president and executive head of the Promat Division of *Poor & Company*, the following promotions have been announced:

W. F. Stark has been appointed vice-president to succeed Dr. Chester. *William F. Mooney* has been appointed vice-president in charge of sales.

Manufacturers' Literature

Vertical Filters

Industrial Filter & Pump Mfg. Co., Dept. MF, 5916 Ogden Ave., Chicago 50, Ill.

Filter leaves that can be lifted from the manifold without unbolting, bottom and top outlet leaves, quick opening cover, jacketed shell, bottom opening filter chamber, and individual leaf outlets are described and diagrammed in a new 8-page folder, Bulletin 111. In addition to a full description of the vertical filter line, the literature also details air wash, sluicing and shaking devices.

Degreasing Equipment

Circo Equipment Co., Dept. MF, 51 Terminal Ave., Clark Township (Rahway), N. J.

The basic line of Circo degreasers for metal cleaning is presented in a 4-page condensed catalog. Standard and special apparatus for handling practically every type of grease or dirt removal problem in either manual or conveyor operated systems are fully outlined and illustrated in descriptive Bulletin 521.

Among the units covered are vapor phase, vapor spray, liquid vapor, pit type and mechanized models which are designed for broad, all-inclusive use by the metal working industry. Design features, an explanation of operation and application information on each type is contained. Also included is data and capacity figures on the firm's solvent recovery still, general information on single or multi-stage power spray washers, an item on port-

SLASH your water bill with this AUTOMATIC EQUIPMENT...



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Water savings of frequently more than 50%, are effected by a Solu Bridge Automatic Rinse Tank Controller installation in usual plating plants. And now, a single instrument, instead of individual instruments can control up to 12 tanks. You save hundreds of dollars in instrumentation cost. The Multi-Point Rinse Tank Controller is a program switcher. Connects with each tank in rotation, against pre-set individual concentration standards. Actuates valves as required for each tank. Indicates unsatisfactory conditions by means of pilot lights. Completely automatic.

- Costs far less than individual controllers for all tanks.
- Permits individual concentration settings for each tank, thereby matching performance of individual tank instruments.
- Provides central control. Soon pays for itself out of water savings and still better quality plating.

Send For Bulletin...

Industrial Instruments, Inc.
89 Commerce Rd.,
Cedar Grove, Essex County, N. J.

able hydro-spray cleaners and facts about degreasing solvents available through the above company.

Acid-Resistant Apparel

Worklon, Inc., Dept. MF, 253 W. 28th St., New York 1, N. Y.

A newly published catalog and reference manual contains a valuable aggregation of news, facts and illustrations in its sixteen pages relating to the very latest developments in acid-resistant and caustic-resistant work clothes.

Special sections are devoted to work garments of DuPont Orlon and Union Carbide Dynel, along with a graphic analysis of the particular advantages and applications of each fabric. Additional pages contain a new group of *lint-free* acid-resistant work clothes of 100% Orlon.

In addition to a wide selection of men's styles, the catalog is featuring ladies' new full length laboratory coats, specially designed for female personnel.

Electroplating Data Chart

Technic Inc., Dept. MF, 39 Show St., Providence 1, R. I.

The new chart provides at a glance all related and comparative data on gold, rhodium, palladium, platinum, silver and nickel, including costs. Much of the information correlated by the above firm has never before been compiled in a single convenient reference unit. Ingenious use of color strips minimizes the risk of confusion in hasty reading of the chart, which is sized 8½" x 11" and is perforated for stringing plus margin for ring binding to permit easy inclusion in any standard notebook.

Just released, the Precious Metal Electroplating Data chart is the latest addition to the firm's series of publications which assemble and correlate specialized material as a service to precious metal electroplaters.

Selenium Rectifiers

Hanson-Van Winkle-Munning Co., Dept. MF, Church St., Matawan, N. J.

A new two-color twelve-page technical bulletin, ER-107, describes and illustrates the manufacturer's selenium rectifiers for electroplating, anodizing and related processing.

The bulletin lists construction, electrical and control features of this rectifier. Also included are the specifications of standard bench, self-contained, and remote controlled types of rectifiers. These detail the AC input, DC output, controls, protection and meters available on each of the three models. There is also a discussion of major electrical and mechanical component parts and a description of the several methods of voltage control. The bulletin covers the complete line of ratings from 6 to 48 volt output.

Each type of selenium rectifier is amply illustrated. In addition to a close-up photograph of each model there are also photographs of the component parts of each rectifier. Included in the bulletin are diagrams of two electrical circuits; the 6-phase center tapped output circuit and, the 3-phase full wave bridge output circuit.



It's still around, Sonny, but you can't see it. It's broken up too fine.

That's the way it is with oil, grease, drawing compounds, stamping compounds, and other soils removed from metal parts in a tank of . . .

Cowles NS SOAK CLEANER

No Scum on the cleaning tank to foul cleaned metal coming out. Clean it with Cowles NS Soak Cleaner and it *stays* clean.

For more information about the emulsifying power of Cowles NS Soak Cleaner for *soak-tank* cleaning before plating, enameling, other finishing . . .

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Cowles CHEMICAL COMPANY
Cleveland 3, Ohio

See Cowles FE and QC advertisements on pages 91 and 99.

Rubber Lining Catalog

Manhattan Rubber Division, Raybestos-Manhattan, Inc., Dept. MF, Passaic, N. J.

A new catalog of corrosion, abrasion, and contamination resistant rubber linings for tanks, pipe, valves, and similar storage and process equipment is generously illustrated and contains many useful charts, tables and diagrams, along with specifications and suggestions covering tanks for the chemical, process, and plating industries.

Although not intended as an exhaustive discussion of the subject, the catalog, No. 7115, contains helpful suggestions for effecting economies in the bulk handling of chemicals, and

a complete guide for the proper selection of lining for use with a wide variety of acids, alkalies, plating solutions and abrasive compounds.

Rinse Tank Control

Industrial Instruments, Inc., Dept. MF, Cedar Grove, N. J.

Automatic control equipment designed to save unnecessary rinsing is described in a new bulletin, which includes the latest multi-point system whereby a single control instrument may be utilized to check up to 12 tanks simultaneously. Complete description is provided on the Solu Bridge electrolytic conductivity system of testing rinse water.

Centrifugal Fans

Chicago Blower Corp., Dept. MF, 9869 Pacific Ave., Franklin Park, Ill.

The manufacturer's line of Airfoil centrifugal fans is described in detail in a new bulletin, A-102, just released.

Germanium Rectifiers

Bart-Messing Corp., Dept. MF, 229 Main St., Belleville, N. J.

Standard models of Sel-Rex Germanium rectifiers, from 500 to 50,000 amperes, capacity, in either forced air or completely sealed water cooled design, are illustrated and described in a new four-page folder, published by the manufacturer.

Polyethylene Products

Crystal-X Corp., Dept. MF, W. Lenni Rd., Lenni Mills, Pa.

An illustrated circular is available from the above firm, listing its polyethylene products such as extruded film and sheet, molded sheet, tanks, vent hoods and ducts.

Corrosion-Proof Heat Exchangers

Falls Industries, Inc., Dept. MF, Aurora Road, Solon, Ohio.

This new 12-page, 2-color catalog provides complete product information on the two newest impervious graphite heat exchangers which have been added to the line of processing equipment produced by the above manufacturer.

The catalog contains a complete explanation of all features of the Cross Bore exchangers and the Cubical unit, as well as cut-a-way illustrations, scale drawings, complete dimensions for all models, and photographs showing actual installations. In addition, all standard models are tabulated to give sizes, transfer surfaces, cross-sectional areas and approximate weights.

Protective Clothing

B. F. Goodrich Co., Industrial Products Div., Dept. MF, Akron, Ohio.

A new 12-page illustrated catalog features the firm's complete line of lightweight, long wearing, easy-to-clean Koroseal industrial clothing, including Koroseal-coated canvas gloves which are recomended wherever extra toughness is needed for handling abrasive materials.

Small Pumps

Eco Engineering Co., Dept. MF, 12 New York Ave., Newark 1, N. J.

The firm's complete line of small rotary displacement and centrifugal pumps for chemical service is fully described and illustrated in a revised bulletin.

Among the units which are detailed in the 4-page folder are Type 316 and Type 20 stainless steel, and Hastelloy C positive displacement pumps, the

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synthetic rubber and bronze low-volume rotary pumps and the Type 20 stainless steel centrifugal pump. Interchangeable impellers for diverse chemical service with the positive displacement line are listed.

A table of recommended uses, complete specifications for each unit and photographs of numerous conventional drives and mountings are also contained.

Air Line Respirators

Mine Safety Appliance Co., Dept. MF, 201 N. Braddock Ave., Pittsburgh 8, Pa.

Three new air line respirators are described in an attractive two-color catalog, No. 1009-8, which illustrates the two basic types available, constant flow and demand flow, and the three facepieces which can be supplied. The respirators are designed for protection in atmospheres not immediately harmful to life such as welding and cutting fumes, toxic dusts, paint spray vapors, and fumes from molten metals.

The bulletin also describes accessories for constant flow and demand flow types as well as portable air line respirator equipment. Blowers, compressors, hose reel, filters, valves, pressure reducers and regulators also are listed in the catalog.

Exhausters

Chicago Blower Corp., Dept. MF, 6869 Pacific Ave., Franklin Park, Ill.

An illustrated bulletin, SPE-103, describes the above manufacturer's new line of steel plate exhausters, designed specifically for removing waste materials such as dust from grinding and buffing wheels, for conveying, and handling hot air and gases in industrial processes.

Germanium Rectifiers

Hanson-Van Winkle-Munning Co., Dept. MF, Church St., Matawan, N. J.

A new two-color four-page bulletin describing and illustrating germanium rectifiers is offered by the above manufacturer.

The four-page folder explains the advantages of the germanium rectifier and all its special features, its efficiency, voltage regulation, controls, cooling and electrical protection.

Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

Tri-State Regional Meeting

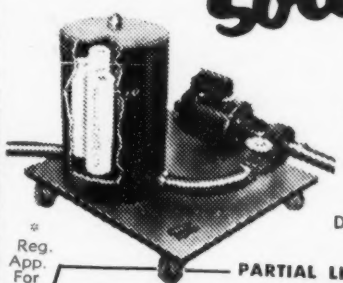
The Annual Tri-State Regional Meeting will be held at the Dayton Biltmore Hotel in Dayton, Ohio, on March 10, 1956.

The Educational Program, with *Clyde Kelly*, A.E.S. president, as moderator, will start at 2:00 P.M. Topics are:

1. "Color Anodizing," by *H. Bengston*, Stolle Corp., Sidney, O.
2. "Plating on Unusual Metals," by *Dr. Charles L. Faust*, Battelle Memorial Institute, Columbus, O.
3. "Plating for Out-of-Door Exposure," by *C. F. Nixon*, head of Electrochemistry Dept., Research Staff, G.M.C., Detroit, Mich.

The social program will include a banquet at 6:30 P.M. followed by entertainment and dancing. Banquet tickets are available at $6.50 each, and may be obtained from *Jack V. Baker* or *Julius Teres*, c/o Dayton Branch.

Filter your solutions!



50-2400 GAL/HR

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Model	Rated Capacity	Overall Size	Weight
LSI-5	50 gal/hr	11"x14"x12"	30 lbs.
LSI-10	100 gal/hr	12"x16"x16"	40 lbs.
ASI-300	300 gal/hr	2'x2'x2'	125 lbs.
ASI-600	600 gal/hr	2'x2'x2'	150 lbs.
RLS-1200	1800 gal/hr	2'x3'x3'	300 lbs.

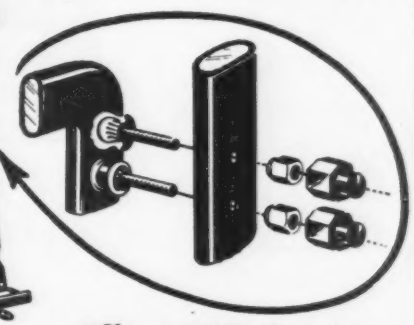
SERVICE . . . Filters practically any acid or alkaline solution from pH 0 to pH 14; removes particles down to one micron in size. Strainer stops metallic objects.

DESIGN . . . Filter Assembly fabricated of stainless steel 316, high temperature lucite, rubber-lined, Haveg or Sethrin* resin. **Filter Tubes** of cotton, dynel, porous stone or porous carbon. **Pumps** fabricated of Hastelloy, stainless 316 or plastic; centrifugal or self-priming. **Motors** drip-proof, totally enclosed, or explosion proof, 110 or 220 volt, single or three-phase, 50 or 60 cycle, sleeve or ball bearing. **Hose**—special acid and alkali resistant. **Base**—Linen Phenolic laminate on rubber tire ball bearing casters.

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Thinker Boy Racks are assembled from precoated members and tips. BELKE Vac-Seal Assembly seals the joints—only contact tips are exposed to the solution. Racks are easily disassembled without damage to coating.

Available as completely assembled racks or precoated rack members and tips.

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When Thinker Boy Racks for a certain job are no longer needed you can respace the members or disassemble and use the parts for other racks.

No added investment. Just order Thinker Boys when you buy racks. Instead of ceilings cluttered with no longer needed racks, you'll soon have a supply of Thinker Boy Parts — be able to assemble coated racks of your own design in a matter of minutes. Ask your BELKE Service Engineer or write for details.

Belke MFG. CO., 947 N. Cicero, Chicago 51, Ill.
EVERYTHING FOR PLATING PLANTS

Chicago Branch

A pre-Christmas spirit pervaded Chicago Branch on December 9, 1955, when the members met for their usual monthly meeting in the clubrooms of the Western Society of Engineers. A solemn beginning at the business meeting was followed by a cocktail hour during which the spirit moved many to wise-cracks and all to general camaraderie giving the occasion a truly holiday touch. To round off the evening, the Educational Meeting, which was conducted as a symposium—covering the subject of "Lining Materials for Use With Corrosive Fluids"—was very capably handled by the following panel:

Charles H. Angell, president Corite Products, Inc.

Charles Kramer, assistant sales manager Carpart Corp.

Mike Nakashima, process engineer Belke Mfg. Co.

All of the speakers have excellent academic backgrounds and sufficient years of experience in the field so that they spoke in practical terms and to the point. As a result, most of the audience had a better understanding of the lining materials best suited to their own conditions and to the particular processes they are operating.

Among the questions answered by the December panel of experts, *Charles Grenko* of Western Electric Co. on "Organic Finishes", *John Cuttone* of Motorola, Inc. on "Plating on Aluminum" and *S. P. Gary, Jr.* of Grunwald Hard Chrome Division on "Plating on Non-Metallics", were the following:

1. Q. What organic coating is best for adhesion to chromium?

A. An epoxy or alkyd melamine resin. Suggested for all but zinc base materials because of temperature of curing.

2. Q. What is the best method to get black to stick on brass?

A. A nitric acid, or a nitric acid and phosphoric acid etch. Do not bake or use a synthetic.

3. Q. Zincate coatings vs. adhesion (concentration of the zincate as a function of adhesion in plating on aluminum).

A. If too fast — a spongy deposit; if too slow — a spotty deposit.

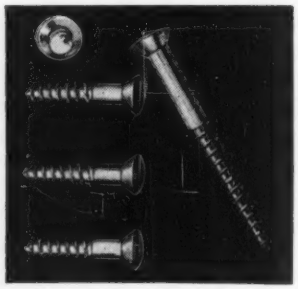
Pittsburgh Branch

The January meeting was featured by a talk and movie presented by *Frank Lisowski* of Wagner Brothers who had selected as his subject "Automatic Plating Equipment and Processes." Frank's coverage of automatic plating machines was very complete. Starting with the essential points to be considered before designing any equipment, he compared all the various features and factors that must be evaluated from a mechanical, contaminating, maintenance, and plating viewpoint in selecting a type of unit to build, either an intermittent or cam rail system.

At the short business meeting which preceded the talk three new applicants were voted into the branch; *John Mechtly*, *Edwin Sokalski* and *Robert Hartung*. *Myron Ceresa* reported for the Ladies' Night Banquet Committee that they had tentatively selected the second Saturday after Easter for the date and the Gateway Plaza as the location.

After the usual beer break, the speaker drew the slip for the door prize winner. *R. E. Woehrle* won a lovely wall barometer presented by *Bud Weiss* of United Chromium, Inc. No free dinners were given away this

CASE HISTORY



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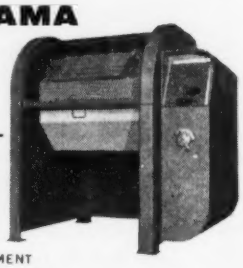
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HINGED BARREL DOOR (Speeds open and close time 90%)	Yes	No	No	No	No
QUICK ACTING CAM LOCKS (Opened without tools)	Yes	Yes	Yes	Yes	No
MODERN, STREAMLINED CABINET	Yes	Yes	Yes	No	No
CABINET PANELS Extra heavy gauge steel-integral part of supporting member (not light sheet metal wrapper)	Yes	No	No	No	No
COLOR ENGINEERED CABINET (For safe and fatigueless operation)	Yes	No	No	No	No
MOTOR SIDEMOUNTED AND COVERED FOR PROTECTION	Yes	No	Yes	Yes	No
VARI-SPEED MOTOR	Yes	No	No	No	No
LOW VOLTAGE CONTROLS RECESSED AND SIDE MOUNTED FOR SAFETY	Yes	No	Yes	No	No
PRESET STOP AND START TIMER	Yes	No	No	No	No
DIRECT READING TACHOMETER	Yes	No	Yes	No	No
POSITIVE STATIC BRAKE	Yes	No	No	No	No

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month since the two members whose names were picked were not at the dinner phase of the meeting.

Herb Schram
Secretary

Los Angeles Branch

A triple-starred program of technical speakers was presented by Librarian *Norman K. McEwan* to open the 1956 meeting schedule of Los Angeles Branch at Rodger Young Cafe on the night of January 11.

The first talk was given by *Paul Silverstone* of Electroforming, Inc., Los Angeles, who discussed the origin, development and current applications of that process. He pointed out that electroforming was discovered about 100 years ago during an experiment to find an improved method for making printed plates, or electrotypes.

Mr. Silverstone illustrated various points of his talk by offering for inspection aluminum plates coated with lacquer, and copper master discs used in making records and, between displays, explained how records and other electroformed objects are produced. He also discussed the various baths used in electroforming and described the difference between electroforming and electroplating.

The second speaker was *William Kastell* of Lockhheed Aircraft, Inc. He gave a talk on cadmium plating with reference to its ultrasonic phases. Follow-up commentary on the same subject was given by *Frank Shaugh* of the Bendix Corp.

After the conclusion of the three talks, McEwan threw the session open to questions and answers which came in rapid-fire order from a dozen or so interested guests and members.

Branch president *Earl W. Arnold* presided over the business session at which four new members were initiated. This, according to a report by Membership Chairman *L. Truman Stoner*, brought the total of new members signed up during the 1955-56 membership drive to ten.

The following guests were introduced by Sergeant-at-arms *Pete Esten: Dale Stockey*, Diversified Plastics; *Don Schneidermann*, Cal-Tech Propulsion Lab., Pasadena; *Richard Zarp*, Alert Supply Co.; *Edward Chapman*, General Electric Co., Ontario, Cal.; *Peter LaBarba*, Price-Pfister Co.; *George T. Strokes*, Glo-Quartz Co., Inc., Willoughby, O.; *Jack Maher*, Glo-Quartz Co., Los Angeles representative; *William Holt*, Udylite Co.; *William Thomas*, Crown Chemical & Engineering Co.; *Burt Watkins*, Mefford Chemical Co.; *Howard Mann*, Norris-Thermador Co.; *Richard Crowe*, Norris-Thermador Co.; *Lloyd Spellman*, Sunset Oil Co.; and *Henry Huizinga*, Kwik-Set Locks, Inc., Anaheim.

Annual Educational Session

Los Angeles Branch will hold its 1956 annual educational session and dinner dance at the Statler Hotel, on Saturday, March 17.

Jim Sowell of Federated Metals, general chairman for the affair, announced that a slight change in the programming followed in previous years will be invoked this year. Instead of morning and afternoon technical sessions, separated by a noon-day luncheon, this year's program will be presented in one uninterrupted morn-

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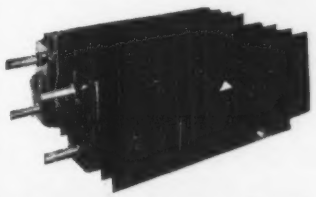
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Two styles available—1. Selenium for cool zones, or 2. Magnesium copper sulphide for the hot, dirty jobs. Units still running after 4 years of constant duty.





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Magnesium copper sulphide rectifiers make your plating power supply more rugged and dependable. Magnesium radiator fins for fast heat dissipation and lighter weight. Matching pairs.

Model 4045—750 amps at 12 volts DC—1500 amps. at 6 volts DC. Operates on 208, 220 or 440 A.C. Weight 525 lbs. F.O.B. Indianapolis, Indiana.

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ing session at which three prominent local and eastern speakers will appear. This programming, Sowell declared, will allow more time for the mid-day luncheon and story telling contest which annually has assumed more popular proportions so that it has cut in seriously on afternoon technical sessions.

The session will open at 9 a.m. and continue until the technical program has been completed. Definitely scheduled to appear is *R. Scott Modjeska*, president of Scientific Control Laboratory, Chicago, Ill., who will offer a talk on "Applications for Plating in the Electronics Industry" during which he will stress printed circuitry, transistors, and solar batteries.

Invitations have been extended, but no definite acceptances received as yet, from *Robert Johnson*, Consolidated Vacuum, Inc., Palo Alto, Calif., and *Ezra Blount*, editor of *Products Finishing* magazine.

The noon-day luncheon is scheduled to get underway about 12:30 noon and will be featured by the annual story telling contest. With more time allotted to this feature, it is expected that several dozen embryo raconteurs will avail themselves of the opportunity to give out with their favorite story. Three prizes will be awarded, based on volume of applause from the audience. All the contestants will probably be gunning for *Carroll McLaren*, who walked off with first prive in 1953, 1954 and 1955.

The annual banquet and ball is scheduled to be held at the Statler Hotel beginning at 8 p.m. on March 17. This affair is annually gaining in popularity among members of the Southern California finishing industry, and General Chairman Sowell is aiming his sights at a larger attendance than the 600 who set a record for attendance at the 1955 dinner dance in the Ambassador Hotel. A floor show, waltz contest and dance music, plus door prizes, are among the entertainment features to be offered.

Chicago Branch

Members of Chicago Branch, undaunted by traditional superstition, met in full force for their usual monthly get-to-gether at the Western Society of Engineers on Friday, January 13. Undoubtedly, the fine list of technical speakers provided by Librarian *Russ Harr* contributes to the good attendance record.

Walter F. Dusseault, product engineer with Divine Brothers Co. was the speaker of this meeting. In his handling of the subject "Should we Purchase an Automatic Buffing (or Polishing Machine)", he reflected his broad and varied background as well as his practical understanding of the field. Since his practical experience has included machine shop and maintenance work as well as years in design work, engineering sales and the installation of finishing machinery, his presentation conveyed information of immediate usefulness to many and was of considerable help to others in their future planning. His discussion pointed out that high labor costs and the increased stress on "eye appeal" demand that far greater consideration be given to the purchase of this type of equipment.

The one very dark moment to mar an otherwise bright occasion was the sadness of all upon the announcement of the passing of one of the most active members of Chicago Branch,

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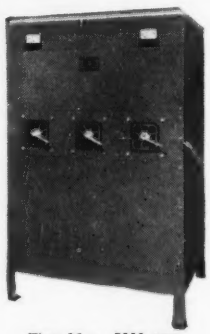
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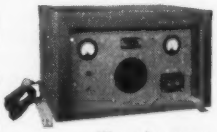
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Harold W. Faint. The Colonel has so often been "kidded", used and abused, and made the work-horse of the Branch that they will look hard and long to find a "show-filler." His sudden passing on December 21st, leaves ony his daughter, Dr. Jean, to carry on the Faint scientific tradition. To Mrs. Faint goes the sympathy of all of the members of A.E.S. throughout the country. All who knew and respected the Colonel will miss him in the days ahead.

Attention was called to the Branch's Annual Educational Session and Dinner Dance to be held at the Conrad Hilton Hotel, Saturday, January 28, 1956. It was expected that the unusually good technical program planned by Librarian Harr and his committee together with the outstanding Dinner Dance and top flight star entertainment under the direction of Banquet Chairman, *R. Scott Modjeska*, will attract a great number of out-of-town visitors. The speakers for this meeting are all nationally known and respected. Headed by *R. S. Wysong* of Studebaker-Packard Corp., acting as moderator; *Phil J. Ritzenthaler*, president of Plating Engineering Company will speak on "Engineering Uses of Plated Coatings." *Joseph M. Andrus*, chief chemist of Croname, Inc., will discuss "Decorative Anodizing," and *Walter Pinner*, executive staff engineer of Houdaille-Hershey Corp., will bring the record up to date by "A Progress Report on Accelerated Corrosion Tests for the Performance of Plated Coatings." During the evening, following a sumptuous feast, members will be entertained by a number of outstanding star acts topped by Lou Breeze as master of ceremonies, with his orchestra acting as accompaniment for the show and furnishing music for dancing during the remainder of a very gala evening.

Baltimore-Washington Branch

The December 13, 1955 meeting of the Baltimore-Washington Branch was held in the Chemistry Lecture Room in the Chemistry Building at the National Bureau of Standards, Washington, D. C., President *William Metzger* presiding.

After a brief order of business Librarian *Edward Bertucio* introduced the speaker, *Bryant H. Gardner*, of PLA-Tank, Inc., who spoke on "Applications for Polyesters in the Metal Finishing Industry." Mr. Gardner began his talk by drawing on the blackboard a diagram which he used to illustrate the particular types and their properties of those plastics used by his firm in the fabrication of their products. This introduction was followed by an excellent color and sound movie showing the fabrication methods used in the construction of various tanks, fume hoods, duct work, and boats. The movie also portrayed numerous installations of this equipment.

That considerable interest was aroused was evident by the length of the question and answer period which followed.

Detroit Branch

The January meeting was held in the Wayne Room of the Statler Hotel on January 6, 1955. A new color movie from the the General Motors Corp., telling the story of the rehabilitation of the American highways, introduced the meeting. This was a joint meeting and the president, *Lee Morse*, introduced the officers of The Electrochemical Society. Lee then discussed

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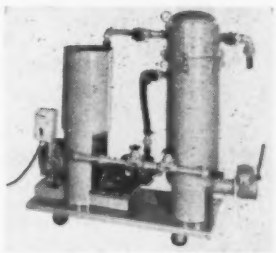
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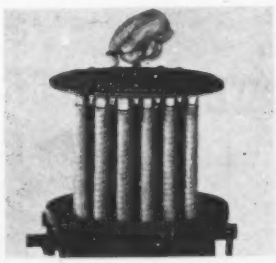
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the reasons for the move to the Sheraton Cadillac for the Annual Christmas Party. Everyone was advised to make their plans as early as possible.

Ed Kubis announced there would be several people dropped from membership if dues were paid soon. Committee Chairman, *Wright Wilson*, gave a report on the Christmas Party. Plans for the course in electroplating being set up by *Fred Brune* will be discussed in detail at the next month's meeting. Anyone wishing to know more about this course, should be present at the February meeting by 7:30 o'clock. *Bob Racine* gave credit to *C. D. Sparling* for his efforts in getting A. T. Wagner Co. as a new sustaining member.

Manuel Ben, technical chairman, introduced the speaker of the evening, *Dr. Herbert Bandes*, manager of Semi-Conductor Development Engineering, Sylvania Electric Prods. Co. Dr. Bandes's talk was on "The Relation of Recent Studies in the Solid State to Electrodeposition."

The meeting adjourned for refreshments at 9:45 P.M.

Pat Driscoll

Central Michigan Branch

The Central Michigan Branch met at the Hotel Hayes, Jackson, Mich. on December 13, 1955. We were honored by a visit from the 3rd vice-president of the supreme society, *Herberth Head*, who gave a brief talk on promoting added attendance at meetings. The principle speaker of the evening was *R. M. Krause* of F. J. Stokes Machine Co. who gave an excellent illustrated lecture on vacuum metallizing. After his talk, Mr. Krause showed samples of metallized work and conducted a question and answer period.

G. S. Woodruff

Buffalo Branch

The date for the second annual Empire State Regional Meeting has been set for April 14, 1955 at the Hotel Statler, Buffalo, N. Y.

After the inaugural of this annual affair was so successful last year in Rochester, the Buffalo chapter is working earnestly to develop a program fully as interesting and entertaining.

There will be an educational session on a few timely subjects, a very interesting program for the ladies, and a banquet and social program in the main ballroom of the Hotel Statler in the evening.

THE ELECTROCHEMICAL SOCIETY



Dr. H. B. Linford (left), professor of Chemical Engineering at Columbia University and secretary of *The Electrochemical Society*, accepts check for $10,000 from *A. L. Foscue*, president of Electro Metallurgical Co., to establish the F. M. Becket Memorial Award. *Mrs. E. B. Folwell*, of Greenwich, Conn., daughter of *Dr. F. M. Becket*, witnesses the presentation. Dr. Becket, a pioneer in the production and

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use of ferro-alloys, for many years headed the research activities of Electro Metallurgical Co., a Division of Union Carbide and a major ferro-alloy producer. The award, in the form of a scholarship, will be available to students who have completed two or more years of study leading to a B.S. degree and are interested in the field of electrothermics.

NATIONAL ASSOCIATION OF CORROSION ENGINEERS

Protective coatings to prevent corrosion will be discussed in a special symposium and also will be the subject of other technical papers at the 1956 annual meeting of the NACE. The Twelfth Annual Conference and Corrosion Show will be held March 12-16 in New York City at the Statler hotel.

Three papers will be delivered in the protective coatings symposium. Sprayed metals plus plastic coatings is the subject of one paper. Another paper dealing with the performance of galvanized coatings is sponsored by the American Zinc Institute. A third paper is titled, Work Measurement as Applied to Industrial Painting.

Chairmen of the symposium are *W. P. Cathcart*, Tank Lining Corp., Pittsburgh, Pa. and *L. S. Van Delinder*, Carbide and Carbon Chemicals Corp., South Charleston, W. Va.

The Association elected *W. F. Fair, Jr.*, Tar Products Div., Koppers Co., Inc., Pittsburgh, president; *W. H. Stewart*, Sun Pipe Line Co., Beaumont, Tex., vice-president and *R. A. Brannon*, Humble Pipe Line Co., Houston, treasurer for 1956-57.

Mr. Fair is the 1955-56 vice-president and Mr. Brannon was re-elected treasurer.

Also elected were three directors. *H. L. Bilhartz*, Production Profits, Inc., Dallas, representing corporate members; *Hugh L. Hamilton*, The A. V. Smith Engineering Co., Narberth, Pa. and *A. L. Stegner*, Tennessee Gas Transmission Co., Houston, representing active members.

All new officers take office March 16, the last day of the conference.

GRINDING WHEEL INSTITUTE

Grant S. Diamond, president of Electro Refractories & Abrasives Corp., has been elected president for 1956 of the *Grinding Wheel Institute*, which has headquarters in Cleveland. Mr. Diamond succeeds *Clarence E. Etheridge*, of the Macklin Co., Jackson, Mich. The Institute represents most of the major manufacturers in the abrasives industry. Mr. Diamond has been vice-president and previously headed the Institute's public relations committee.

News from California

By Fred A. Herr



Henry "Hank" Huizinga, formerly with the plating department of Ford Aviation Division, Chicago, Ill., in January took over the post of superintendent of metal finishing for Kwik-Set Locks, Inc., Anaheim, Calif. He assumed the position of *Don Kall* who died of a heart attack in December. Huizinga, a member of Chicago Branch of the A.E.S., has taken up residence

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in Anaheim and plans to transfer his A.E.S. membership to Los Angeles Branch.

George T. Strokes of the Glo-Quartz Electric Heater Co., Inc., Willoughby, Ohio, was on the West Coast on a business trip in January. He visited Los Angeles, where he attended the January A.E.S. meeting with *Jack Maher*, the firm's Southern California representative, and later in the month made stops in San Francisco and the Pacific Northwest.

Hughes Aircraft, Inc., Culver City, Calif., has acquired the plant building of Nash Motors Co. in El Segundo, Calif. The transfer of all electronics manufacturing, processing and plating facilities from the Culver City plant and the 104th Street feeder plant was under way in January and was expected to be completed by February 1. Plans are to combine the plating and processing facilities of its two other plants in the Nash plant. While some plating will continue on a reduced scale in Culver City, all finishing of electronic parts and the major phase of other plating will henceforth be centered in the newly acquired Nash plant.

J. Stewart Krentel, sales engineer for Hanson-Van Winkle-Munning's Los Angeles branch, and Mrs. Krentel finally got off on their belated mid-winter vacation on January 13. "Stu" had planned to fly to Mexico with his wife late last fall when something came up to delay things. Again all was set for a late December take-off when Stu's Alma Mater, Michigan State University, threw a monkey wrench into the plans by winning the bid to play in the Rose Bowl. Of course, Stu, a rabid MSU rooter from way back, stayed put in order to root MSU to a spectacular 17 to 14 victory over UCLA on January 2.

Stu and the Missus flew to Mexico City. They planned ten days of leisurely travel south of the border, with stops at Mexico City, Guadalajara, Acapulco, and wherever else the elf of fancy leads them.

Don Bedwell, plant superintendent of the Hall-Mark Co., Los Angeles, and Mrs. Bedwell, chose Florida for a January vacation and ran smack into the coldest freeze Florida has experienced in decades. He had not yet returned to the caressing warmth of Southern California when this item was written, but it's fairly certain that Don, a Los Angeles citizen for 4½ decades, will confine his vacationing in the future to the Golden State, smog and all.

Sanford Process Co., Los Angeles, recently completed installation of a 27 foot long tank for hard coating aluminum in its plant at 6920 South Central Ave.

The new plant, now nearing completion after a year's construction, contains 10,000 square feet of area allocated to the hard coating of all alloys of aluminum. Approximately two-thirds of the floor area is devoted to tanks for hard coating, rinse, seal, and color work. The new 27 foot tank is 6 feet wide by 8 feet deep and enables the firm to handle aluminum parts of greater size than heretofore.

The tank requires 8,000 amps. The

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Plans for a second building to be erected across the street are now under way. That unit will be used for expanded space for shipping, receiving and sales activities. The firm's former plant at 3506 S. Central Ave. is being operated as a pilot plant and laboratory.

Ryan Aeronautical Co. of San Diego, Calif., has construction under way on a new building which will add 45,000 sq. ft. of floor area for storage of active tools. The new 150 x 300 foot building supplements recently completed additional facilities at the Ryan plant which included expansion of the machine shop and electronics department, and establishment of a huge process tank area.

Baron Industries, 241 West Avenue 26, Los Angeles, has completed construction on a new 5,000 sq. ft. plant addition as the first of several new buildings to be erected on a 22,000 square foot site acquired to the east of the main plant. Plans are under way for erecting another 5,000 sq. ft. unit in the near future. The firm manufactures industrial ovens, vapor degreasers and paint finishing equipment. Plans for opening a branch sales office in Oakland, Calif., are under way.

Beckman Instruments, Inc., Fullerton, Calif., reports the appointment of *Donald C. Duncan* as general manager of its Berkeley Division at Richmond, Calif. *Thomas Allinson* has been named manager of the Berkeley Division and will serve under Mr. Duncan, who continues to function as general manager of the firm's Helipot and Arga Divisions in South Pasadena, Calif.

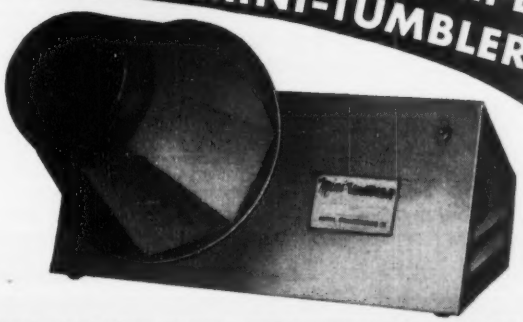
Two West Coast appointments have been announced by *Rockwell Mfg. Co.'s* Meter & Valve Division: *William F. Gulley*, who served as Seattle district sales manager since 1951, has been named San Francisco district manager; and *Roy E. Nimitz* has been promoted from San Francisco sales engineer to district manager at Seattle.

Howard E. Pellett, formerly active as a partner in the Pasadena Steel Treating Co., Pasadena, Calif., has joined the staff of Metal Control Laboratories, Inc., Huntington Park, Calif., as metallurgist.

John W. Bizot, formerly assistant chief metallurgist at Kaiser Aluminum & Chemical Co.'s plant in Trentwood, Wash., has been named chief metallurgist for the firm's foil mill at Permanente, Calif.

The evening division of Los Angeles City College is offering two courses

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in paint technology which are sponsored by and recommended by both the Los Angeles Paint & Varnish Club and the Los Angeles Paint, Varnish & Lacquer Assn.

The courses are being offered during the Spring Semester beginning January 31 at the City College Campus, 855 N. Vermont Ave., Los Angeles. One course is entitled "Enamels and Varnishes" and deals with resins, oils and related materials, and methods of manufacturing enamels, varnishes and specialties. It is held once a week on Monday from 7 to 9 p.m. The second course is a laboratory course on enamels and varnishes for students already enrolled in paint technology study, and is offered every Thursday night from 7 to 10 o'clock.

An annual market report completed recently by Kaiser Steel Corp. revealed that steel consumption in the Western states reached 6.2 million tons, topping the previous record year (1953) by 600,000 tons. Other facts contained in the report were:

Western tin plate receipts constituted 18% of the national market, a larger proportion than any of the other product groups. Southern California, the top consuming area in the West, accounted for 40% to 50% of the total western market for sheet and strip products. Northern California, because of the concentration of canneries there, accounts for 60% of the western tin plate market. Western steel mills, according to the Kaiser report, continued to supply about half of the western demand for steel products.

OBITUARIES

DR. ALLAN E. CHESTER

Dr. Allan E. Chester, vice-president of *Promat Division, Poor & Co.*, died November 20, 1955, enroute to Honolulu. He was fifty-four years old.

Dr. Chester received his Bachelor of Science degree at Kenyon College, Gambier, Ohio, and a Doctor of Science degree from California Institute of Technology, Pasadena, Calif.

An outstanding research chemist, Dr. Chester held many patents in the fields of electrochemistry and vitreous enameling. He came to Poor & Co. from Ferro Corp. in 1938, and as research director, formed the Promat Division. He was made vice president in 1952.

Dr. Chester was active and held offices in a number of technical societies among them, The American Electroplaters' Society, American Society for Testing Materials, Ceramic Society, National Association of Chrome Furniture Manufacturers, The Electrochemical Society, Faraday Society, and The American Association for the Advancement of Science.

He is survived by his wife, Alice, Highland Park, Ill.; a daughter, Sister Vera C. S. J., Jamestown, N. D.; and two step-sons, John H. Bins of Lake Bluff, Ill., and Thomas W. Bins, of Lake Forest, Ill.

HAROLD W. FAINT

Harold W. Faint, Chicago — Western States sales manager for Metal Finishing Division, *Frederic B. Stev-*





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ens, Inc., died suddenly from a heart attack December 22, 1955.

Prior to joining Stevens in 1953, Faint was sales manager, Industrial Filter and Pump Mfg. Co., Chicago, where he was employed seven years.

He had served the metal finishing industry a total of 30 years in several capacities. In addition Faint served in both World War I and II with the U. S. Army and was only recently retired as a Lt. Colonel in the U. S. Army Reserve.

Faint was a member of several professional and fraternal organizations and also served on the Board of Managers, Chicago Chapter, American Electroplaters' Society.

He is survived by his wife, *Marguerite*, Chicago, and daughter, *Dr. Jean Faint*, Syracuse, N. Y.

NEW BOOKS

Specifications and Tests for Electrodeposited Metallic Coatings

Published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. 1955. 96 pages. Price: $1.85.

This compilation of 17 specifications, methods of test, and recommended practices embodies the work of ASTM Committee B-8 on Electrodeposited Metallic Coatings. These ASTM Standards in the field of electrodeposition of metals have either been developed jointly with the American Electroplaters Society, or have had subsequent endorsement by this group.

Since the last issue in 1953, all but 5 of the 17 standards have been revised. Many of the revisions have been based on extensive research projects within the committee, including long-time atmospheric exposure tests of copper-nickel-chromium plated steels.

The book contains specifications for zinc, cadmium, nickel-chromium, and lead on steel; nickel-chromium on copper; nickel-chromium on zinc; and chromate finishes on zinc coatings. In addition there are recommended practices for preparation of low-carbon steel, high-carbon steel, zinc-base die castings, and copper-base alloys for electroplating; chromium plating on steels; and preparation of and electroplating on stainless steel and aluminum alloys. Methods of test include test for local thickness and two spray tests—the salt spray (B 117) and the acetic acid-salt spray (B 287).

All those concerned with electroplating, the purchase or sale of plated products, those people concerned with the use of protective coatings and others will find this compilation of value.

Metals Handbook—1955 Supplement

Published by American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. 1955. 200 pages plus index. Price:$4.00 to ASM members, $6.00 to non-members.

This second supplement to the 1948 edition of the Metals Handbook is the work of 19 committees comprising 190 outstanding engineers, and is intended to bring the handbook up to date. The material was originally published in *Metal Progress* but the cloth-bound form now available will be desirable for the library shelf. Three sections of the supplement will be of interest to the metal finisher. As a matter of fact, one of these, on metal cleaning costs, is alone of sufficiently great value to warrant purchase of the book. It covers direct labor for cleaning and waste removal, water, energy, materials, equipment, maintenance and cost studies of various cleaning processes. The other valuable section is on the selection of electroplated coatings for different purposes, including protective and decorative coatings and special purpose deposits. A third section is on the surface finish of metals.



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Symposium on Properties, Tests, and Performance of Electrodeposited Metallic Coatings

February 29

Hotel Statler — Buffalo, N. Y.

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SITUATION OPEN: We need experienced, successful technical sales representative with proven sales record for expanding sales program. Must know plating, phosphating, porcelain enameling, other finishing. Liberal draw, commissions, expenses, car, other benefits. Write age, experience, income requirements, territory preferences.

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METAL CLEANER DEPARTMENT

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SITUATIONS WANTED

PLATER

SITUATION WANTED—Plater with fifteen years experience, ten years as foreman, of plating, polishing, buffing and barrel finishing departments. Would prefer a job with small manufacturer. Can furnish the best of references. Address: January 4, care Metal Finishing, 381 Broadway, Westwood, N. J.

BUFFING AND FINISHING SUPERVISION

SITUATION WANTED—I have 18 years experience on metal polishing and finishing; have worked on copper, brass, sand polishing, and finish inspection on silverware. I have taught others to buff and polish and understand production control. Address: December 5, care Metal Finishing, 381 Broadway, Westwood, N. J.

FINISHING SUPT.

SITUATION WANTED—Desire position as Finishing Supt. in metal fabricating line. Have 35 years experience as finishing supervisor in all phases of plating, polishing and lacquering and pigmented materials. Extensive experience with copper, nickel, chromium, brass, zinc and silver plating, both in barrel and still tank operations. Experience in following lines: luggage hardware, building hardware, holloware, automotive accessories, tubular furniture. Analyze, control all types solutions. Address: Jan. 5, care Metal Finishing, 381 Broadway, Westwood, N. J.

SUPERVISOR

SITUATION WANTED—Have 35 years in the plating field and am capable of full responsibility. Can maintain and analyze solutions of all types and set up and get out production. Desire position in Metropolitan New York. Address: February 5, care Metal Finishing, 381 Broadway, Westwood, N. J.

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SITUATION WANTED—I have 27 years experience on all metals. Capable of handling men and teaching beginners. Production and estimating on all types of work — floor lamps, hardware, silverware, plumbing supplies, jobbing shops and chandeliers and electrical fixtures. Address: January 6, care Metal Finishing, 381 Broadway, Westwood, N. J.

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SITUATION WANTED—Have 25 years of experience in all types of electroplating and anodizing. Can make up and maintain solutions; also full knowledge of buffing, metal spraying, soft soldering and white metal casting. Have been in supervisory capacity for past 15 years. Address: December 4, care Metal Finishing, 381 Broadway, Westwood, N. J.

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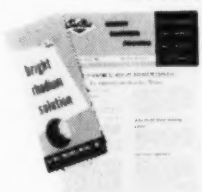
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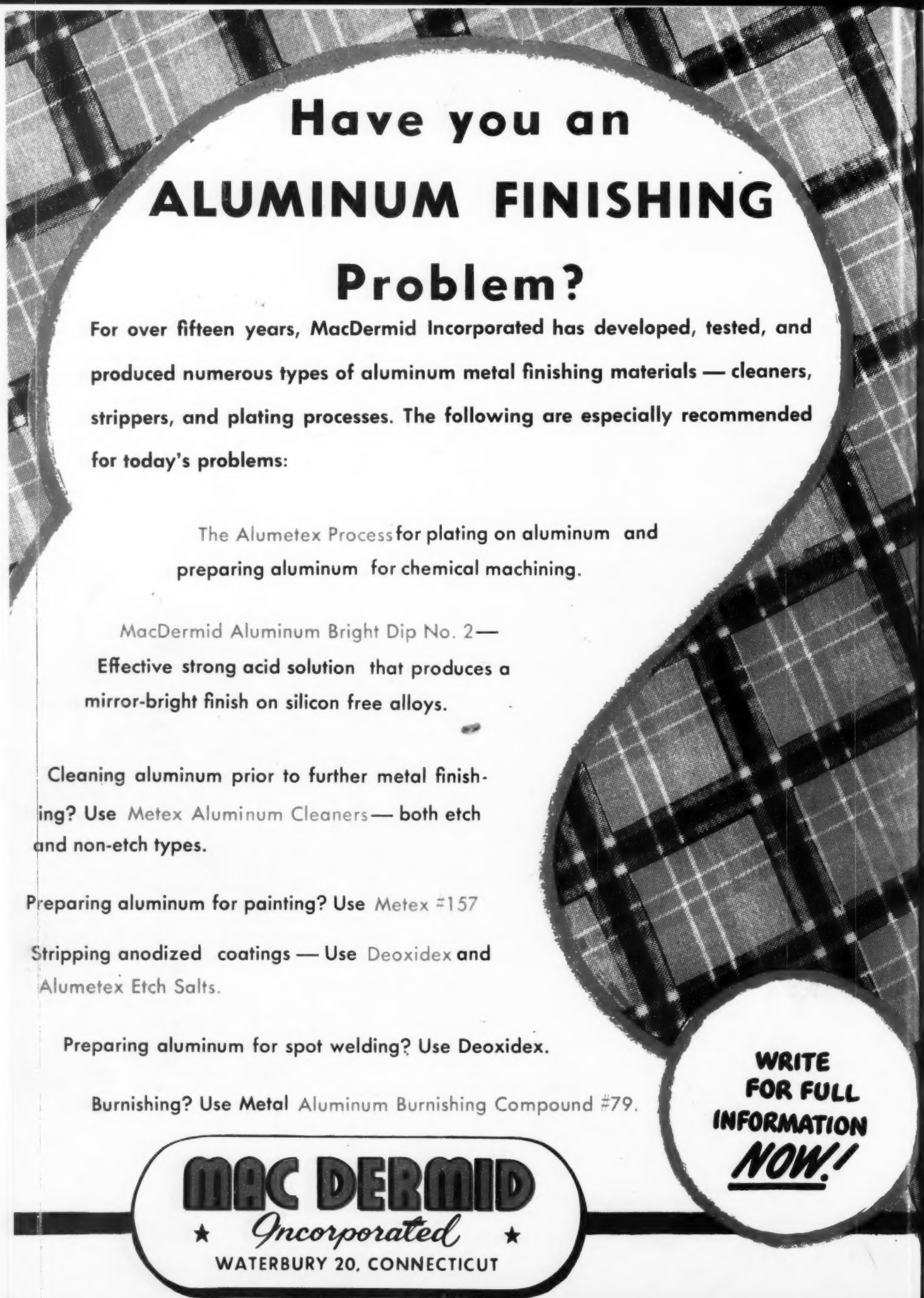
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